the OIL AND GAS JOURNAL
PUBLISHED WEEKLY AUGUST 14, 1961

CANADIAN REPORT

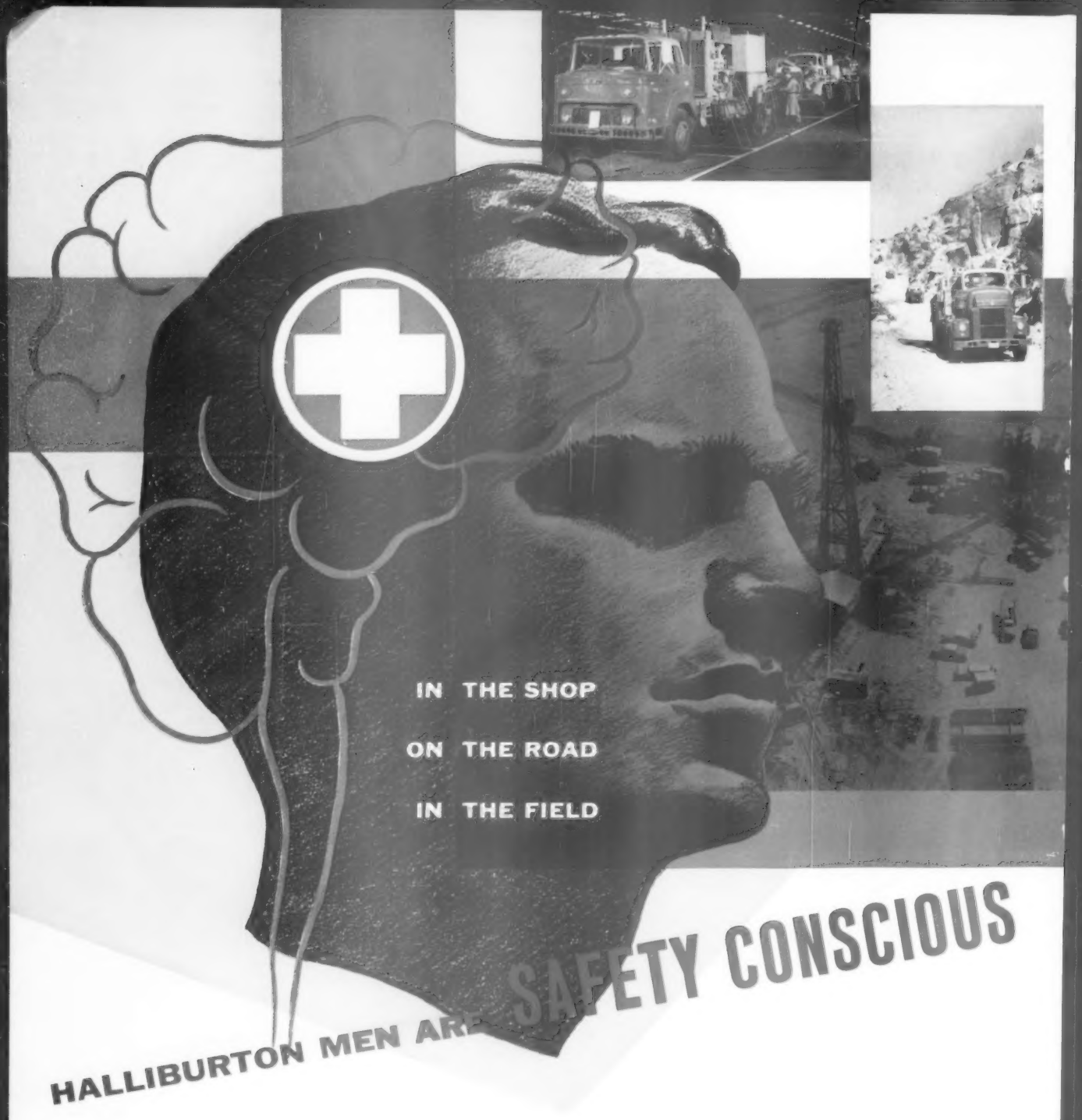
on

Gas Processing

Gas-Liquids Production

Pipelining and Utilization of Gas Liquids

p.134



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OIL AND GAS JOURNAL
Vol. 59, No. 33

Contents August 14, 1961

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CANADIAN REPORT

National Oil Policy is Boon to Canadian Industry 134

By Gene T. Kinney

In only 6 months' existence, Canada's new policy has succeeded even beyond the expectations of its sponsors. And its impact should be more lasting than the ephemeral export demand created by the curtailment of Middle East supplies when the Suez was closed in 1956.

Canada is Pipelining's Bright Star 144

By Paul Reed

Prospects for pipeline construction in the next wave of expansion and extension of petroleum and natural-gas systems are discussed in terms of pipe and horsepower. The meaning of recent differences of pipelining natural-gas liquids—particularly condensate—in Alberta is explained.

Alberta Gas Trunk Line has Unusual Status and Functions 156

By Paul Reed

An unprecedented organization for a $155,250,000 pipeline system operates safeguarding interests of producers, utilities, export lines, and the Province of Alberta.

Growing Pains are Afflicting Canada's Flourishing Gas-Processing Industry 158

By Hugh S. Pylant

Prospects for Canada's fast-growing natural-gas industry were brightened considerably by recent approvals of large-scale gas exports to the U. S. These, added to a growing domestic demand, will require the gas-processing segment of the industry to almost double its capacity in the next 2 years.

TECHNOLOGY—OPERATION

Refining-Processing

Moving Day for a Cat Cracker 106

By H. C. Bozeman

Signal moved not only the cat cracker, but also a cooling tower, two spheres, and four boilers to its Houston division refinery.

Lean-Gas Processing and Marketing in South Louisiana 110

By H. C. Bozeman

Goliad-Union decided to make direct measurement of residue gas, plant fuel, products, and vented vapors, and design the extraction plant with a low-temperature-absorption process and high thermal efficiency.

Processing Notes 116

Gulf's new lube-oil hydrofinishing makes debut—Atlantic's new computer center will perform several chores—Tenneco Oil enters petrochemical field.

Process Costimating No. 99 120

By W. L. Nelson

Depreciation, obsolescence, and similar costs are discussed.

Drilling-Production

Wells up to 50,000 ft. Deep and 700° Hot can be Successfully Cemented 108

Cements containing ground silica have proved versatile and effective in more than 400 wells in many parts of the world. These have been successful not only in primary cementing, but also in squeeze cementing, cementing liners, and plugback operations.

Oil-Well Pumping—52 118

By Joseph Zaba

A look at current trends. This completes the series on oil-well pumping that started June 13, 1960.

Get True Resistivity from Induction Logs 122

By R. H. Lindley and C. R. Davis

Finding formation-water saturation is a hard job if true resistivity is unknown. Here's a new method, using two different induction logs, that bypasses the problem of filtrate invasion, and provides a workable value of true resistivity.

THE OIL AND GAS JOURNAL **Newsletter**

August 14, 1961

Significant this week

The Athabasca tar sands have been conquered.

World's biggest hydrocarbon supply is locked in the sprawling reserves along Athabasca River in northern Alberta. For 50 years, efforts at commercial oil recovery failed.

Now the required technical breakthroughs have been made.

Pilot plant operated by four-company combine reportedly has shown results that make large-scale production feasible. Tar-sand oil would be competitive with other Alberta crude.

It's also reported that plant capable of producing 100,000 bbl. daily is projected. Combine includes Cities Service Athabasca, Richfield, Imperial, and Royalite (p. 79).

FPC should drop its area-pricing approach because it just won't work.

That's the opinion of Edward B. Marsh, chief examiner for commission. In a formal recommendation against area pricing, he points out that serious questions have been raised about its legality. And he warns FPC that any step it takes in area pricing is almost sure to be challenged (p. 84).

Gas-industry construction will reach a whopping $1.9 billion this year—an all-time high.

Estimate comes from American Gas Association. It compares with outlay of $1.8 billion by gas-distribution and pipeline companies in 1960.

AGA looks for construction outlay to rise to $8.2 billion in 4-year period of 1961-64. That's a hefty increase over the $6.9 billion spent in 1957-60 period (p. 84).

Canada's oil industry has snapped into high gear.

Speedup, inspired by new national oil policy, is all the more dramatic because industry had been lagging.

You'll find a crisply written rundown on the impact of the policy in the Journal's Canadian Report. This authoritative roundup—a yearly tradition—covers all major phases of Canada's oil and gas operations (p. 134).

Engineer salaries are rising.

Last year, median income of professional engineers hit record $10,660.

Petroleum engineers who got started in early 1920's are now earning up to $5,000 more than other kinds of engineers

with the same amount of experience. But median for young PE's is below that of other beginners (p. 93).

Trend nowadays is toward shallower drilling.
Average wildcat has been getting shallower since 1954. Journal study also shows average depth of field wells since 1952 has been almost static (p. 85).

Expect a reversal for Trans-Northern Products Line, now that Shell has confirmed it will build refinery near Toronto.
Trans-Northern has been moving to Ontario about 50,000 bbl. daily of products refined from foreign crude in Montreal. Shell refinery project and new national oil policy caught company in the middle. That policy reserves Ontario west of Ottawa Valley for Canadian supplies (p. 98).

Russia wants to make tracks in pipeline technology.
Intensive work on welding techniques and other pipelining research is being conducted. U. S. gas delegation that toured Soviet Union last month saw some results.
Former FPC commissioner William R. Connole, member of the group, says pressure-welding demonstration was particularly impressive. In the second of a series of articles written exclusively for the Journal, he also describes visit to soviet pipeline spread (p. 86).

Private oil companies in Indonesia have stronger hopes of cooperation from government.
They pin these hopes on new agency that will supervise entire range of country's oil affairs. The six members of this agency are Indonesia's most experienced oil men (p. 104).

News in the making

Texas Railroad Commission wants tighter crude estimates.
It's suggesting gently but firmly that crude buyers be a lot more specific in their 6-month estimates of needs.
This ties in with recent TIPRO call for better data from purchasers. Association said this should be first step in drive to get Texas more equitable share of U. S. crude market.

Washington checklist:

It will be some time before decision is reached on tax treatment of ABC deals. After Internal Revenue Service has completed current study, it will clear any proposed change through White House.

Over-all tax changes by Congress will be kept at minimum this year. There's little chance for special concession for new-plant expenditures. Nor will tax status on foreign investments be changed.

It's a good bet that OCDM won't recommend dropping of

residual-fuel import controls. But Interior may make some changes in existing rules.

Justice Department guidelines for reactivated Military Petroleum Advisory Board are expected soon.

There'll be a delay in heralded second official meeting of Organization of Petroleum Exporting Countries.

Meeting had been slated for Tehran August 19, but several things interfered with plans. Fledgling OPEC staff hasn't finished a number of reports intended for presentation. Iraqis are preoccupied with impending, but still unscheduled, resumption of talks with Iraq Petroleum Co. Finally, neither Iraq nor Kuwait has much stomach for session at same table until dispute over Iraqi claim to shaikhdom has cooled.

Civic groups are going to bat for Permian gas producers.

Chambers of Commerce in Midland and Odessa, Tex., are lending hand in drive to gather data for regional economic survey. Purpose: To show FPC at upcoming area-price hearing that current rules and price limitations have "curtailed development" of West Texas and Southeast New Mexico producing counties. Representatives for nearly all these counties will meet in Midland August 17 to discuss survey.

Pan American's tight-hole wildcat in Alaska's Bethel basin will be drilling again this week below 14,255 ft.

The test last week completed a fishing job at that depth and was reconditioning hole. Well, spudded March 20, is finding thicker sedimentary section than anticipated, according to reports from Alaska. Pan Am is operator for itself and 10 other companies.

Look for good pickup in exploration and wildcatting in Appalachian basin this year.

Budgets of some majors contain proposals for sizable outlays in West Virginia, New York, Pennsylvania, and western Kentucky sectors.

Union Oil Co. of California wants to expand marketing and refining outside Pacific Coast states, but apparently Delhi-Taylor isn't springboard for the move.

Executives of Union have looked over Delhi-Taylor's Texas properties. However, Union spokesman in Los Angeles says company "definitely is not interested and has no negotiations" under way for purchase.

It's now virtually certain that Rep. Frank Ikard (D.-Tex.) will become a top official in API.

Ikard and API President Frank Porter last week said they have held talks on the possibility. "These discussions have not been concluded," they said. "There will be no further announcement in the immediate future."

Market memo

Aug. 14, 1961

Oil marketers are experimenting with **plans to expand their merchandise base** at service stations. Latest moves in this direction have been made by Pure and Ohio Standard.

Pure has established **Montgomery Ward** catalog sales agencies at three stations in Palatine and Fox Lake, Ill., and Greensboro, N. C. Fourth may be opened later this year at Lakeland, Fla.

Customers can order the full line of Montgomery Ward merchandise, get quick mail delivery, receive the full Montgomery Ward guarantee, and obtain credit.

For Pure, the experimental move was made to improve service to present customers and to attract new patronage. For Montgomery Ward, the plan offers its customers a place to park and quick, convenient service in ordering merchandise.

Ohio Standard is serving hot lunches to customers at two of its stations on interstate routes in Ohio in less time than it takes to service the car.

The food is precooked, frozen and packaged in individual sealed containers by Stouffer Corp. Electronic ovens are installed at the stations to warm the food. A hostess is on duty to help the customer select food from refrigerated vending machines and see that disposable plastic dishes and utensils get into waste containers.

Stouffer provides complete meals plus sandwiches, soups, casseroles, pastry, and breakfast food. Other suppliers stock machines vending milk, hot chocolate, soft drinks, candy, and cigarettes.

Sohio and Stouffer hope to attract customers off limited access highways into the service stations at interchanges. Food service is not permitted on the interstate system.

Pricing trends:

Gulf Coast and **Mississippi River** markets have a slow tempo but remain firm on both gasoline and distillates. Some marketers estimate as much as 2,000,000 bbl. of gasoline has been bought and moved off the Gulf Coast in the last month. This has removed potential distressed stocks from the spot market, leaving a price of 10.75 cents for regular in a firm position. No. 2 is strong at the 8.5-cent posting but there are few offerings at this figure. Low New York harbor price of 9.5 cents plus rising tanker rates discourage much distillate movement from the gulf. A price rise of at least 0.3 of a cent is needed in the East to restore balance.

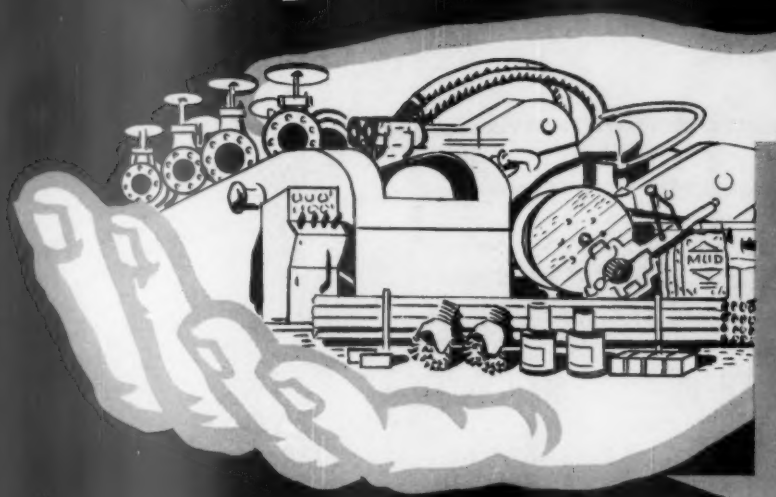
Earlier movement of No. 2 from mid-river points to Gulf Coast points is running into tendency of suppliers now to hedge against a price increase soon.

Price shading on gasoline is prevalent in **Mid-Continent** with spots generally off one-fourth cent to 11.25 for regular. New price troubles have developed at Indianapolis after Gulf introduced its economy regular grade and in Detroit and Chicago.

General trend of price firming ran through weak **East Coast** gasoline markets. Normal prices were restored in western Pennsylvania following an earlier move in the eastern part of the state. Esso moved up prices in New England and at Charlotte, N. C.

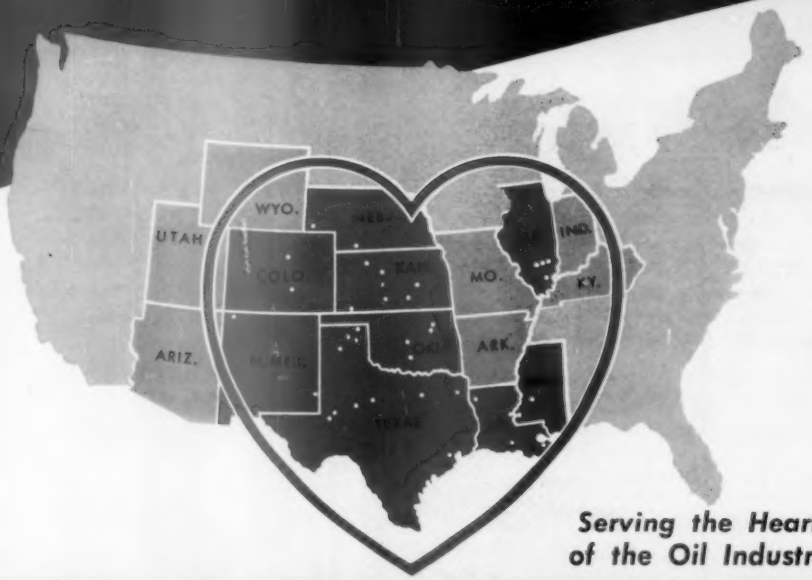
Bigger Stocks

SUPPLY BOVAIRD COMPANY



ON HAND NEAR *well* YOUR ~~DOOR~~ STEP

SAVE YOU TIME



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Gas reforming hits a new high Engineering news was made in France recently, when a Chemico high-pressure gas reform furnace operating at 250 psi was placed on stream. Prior to the completion of this project, no gas reformer in the world had ever operated at pressures above 175 psi. Design innovations incorporated in this plant reduce compression requirements and increase heat recovery.

This historic breakthrough in gas reforming is indicative of the skill and experience which Chemico brings to all process engineering problems. Chemico services to clients in the process industries range from initial laboratory research and testing to final construction and start-up. If you are interested in learning more about Chemico, write to "Department B".

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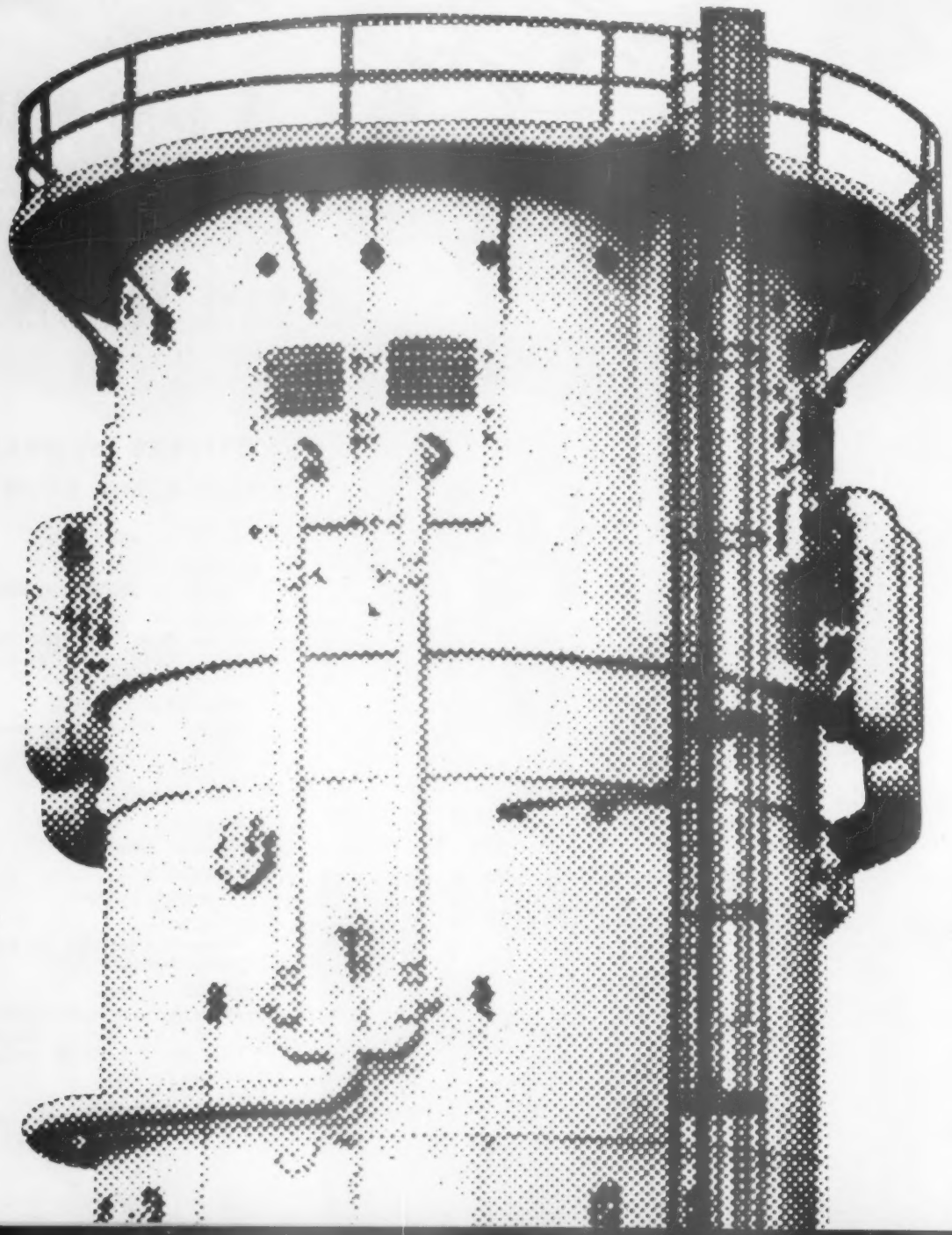
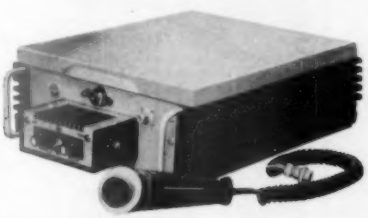


RCA "LD" 2-way radio has the guts to stand up to the toughest jobs!

There are rugged places where men, trucks and 2-way radios have to go, and each has to be a proven, reliable performer. In 2-way radio, this means quality must be built-in to take the gaff—quality such as only the leader in radio and electronics can offer—in the new RCA "LD" (Low battery Drain). Quality and price are combined in this dependable RCA equipment to give you the very best performance at the lowest cost. Use it on the roughest roads—Security Sealed Circuits are your assurance it can take it. Leave the radio on when your vehicle engine is turned off—battery drain is negligible—transistors are used in circuits where they have been proven to be most dependable.

It took experience and daring to bring you today's RCA 2-Way Radios. It meant discarding preconceived notions about circuits and redesigning with transistors in key places for reliability with economy. And it involved engineering a host of other advanced features to assure fine message intelligibility, and long component life at moderate cost.

Your RCA Communications Specialist will be glad to show you why the "LD", dollar for dollar, feature for feature, is today's greatest 2-way radio value. Or send coupon for further facts.



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This precision cementing capability is exercised by your Halliburton Cementer. He knows how to use the tools, machines, and materials to help you get the very best results possible from your cementing job.

Some Halliburton methods for providing Precision Cementing Control...

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OF SETTING TIME

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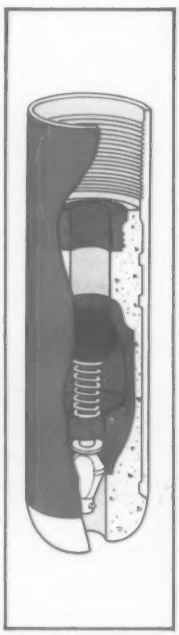
OF FLUID LOSS

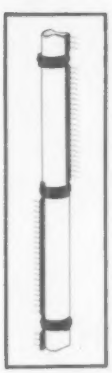
HALLIBURTON HALAD-9 controls fluid loss of cementing compositions to increase efficiency in primary and squeeze cementing. Sustained heat stability under extreme bottom-hole temperatures provides an advantage in hesitation squeeze techniques.

WITH MODERN TOOLS

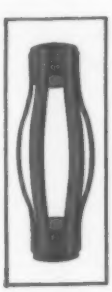


AUTOMATIC FILL-UP SUPER SEAL FLOATING EQUIPMENT eliminates frequent stops for manual filling of casing — saving rig time. Carefully-calculated orifices in the fill-up attachment permit control of fluid flow into the string. An orifice sleeve attached to the Super Seal valve stem holds the valve off its seat, permitting filling.

Increasing pressure from a conventional rig pump at any time shears a pin and allows the spring-operated Super Seal back pressure valve to close and help float casing to desired hole depth. All internal parts are drillable. Halliburton Automatic Fill-Up Super Seal Float Shoes and Float Collars are available for all standard casing and tubing sizes.



HALLIBURTON ROTO WALL CLEANERS remove mud cake from the borehole wall . . . provide a better cement bond and minimize squeeze cementing jobs. This easy-to-install cleaner causes less mud cake disturbance while running casing and operates only in the zones where needed. Coiled springs inside the cleaner base protect spikes from damage while running-in and rotating to remove unwanted mud cake. Roto Wall Cleaners are available to meet all specifications — including slim hole sizes.



HALLIBURTON S-3 CENTRALIZER centers to secure uniform cementing on all sides of the casing for a better cement bond . . . even in greatly deviated hole. Clearance between the centralizer's end bands and the casing permits free rotation of the casing. The centralizer's 28-in. long heat-treated steel springs cover adequate sidewall to avoid key seats. Open spring spacing provides free fluid flow.

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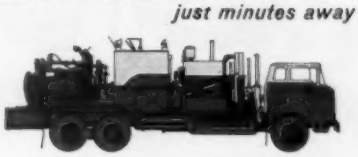

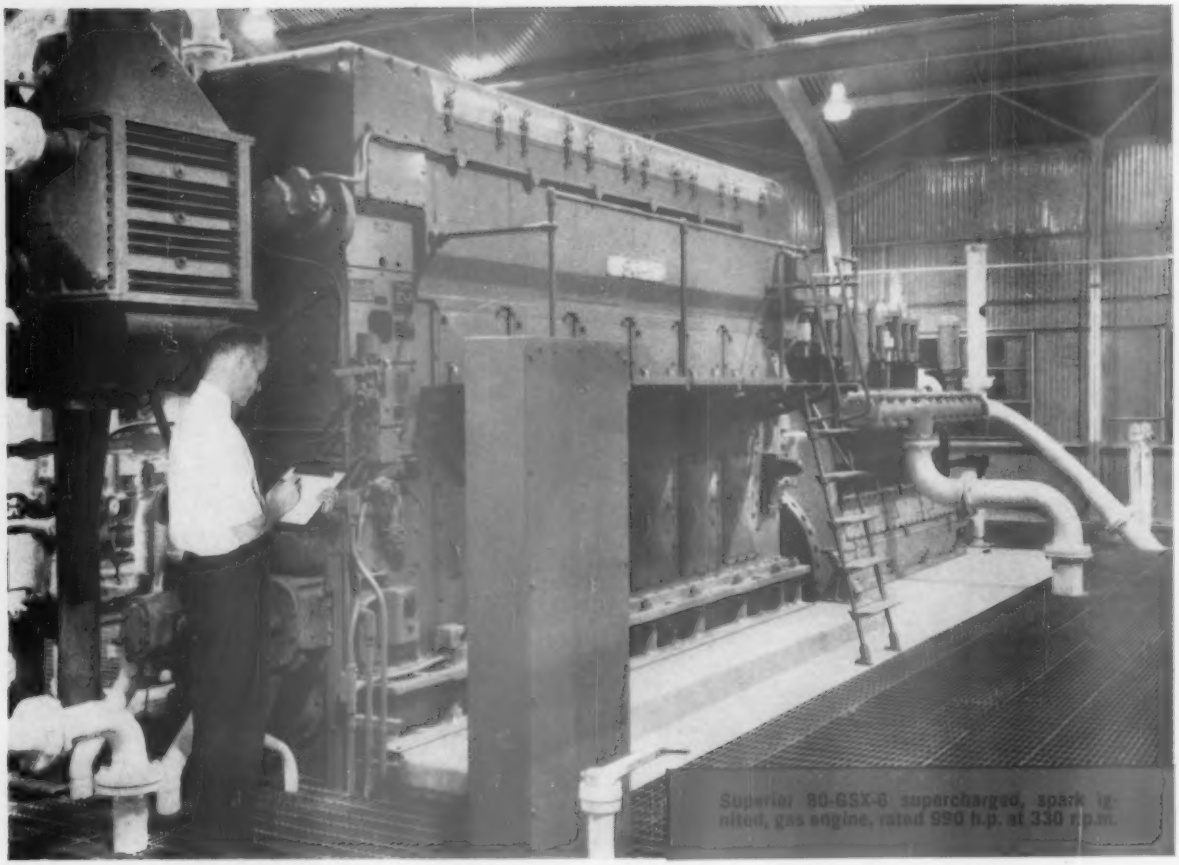

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SUPERIOR engines power West Texas waterflood

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Six Superior 80-GSX-6 supercharged, spark ignited gas engines and twelve 6G-510 gas engines drive the pumps for one of the largest oil company's two large waterflood plants in West Texas. These busy plants inject 120,000 barrels of water per day at 2,150 p.s.i. into the two fields covering 20,000 acres and 520 oil wells.

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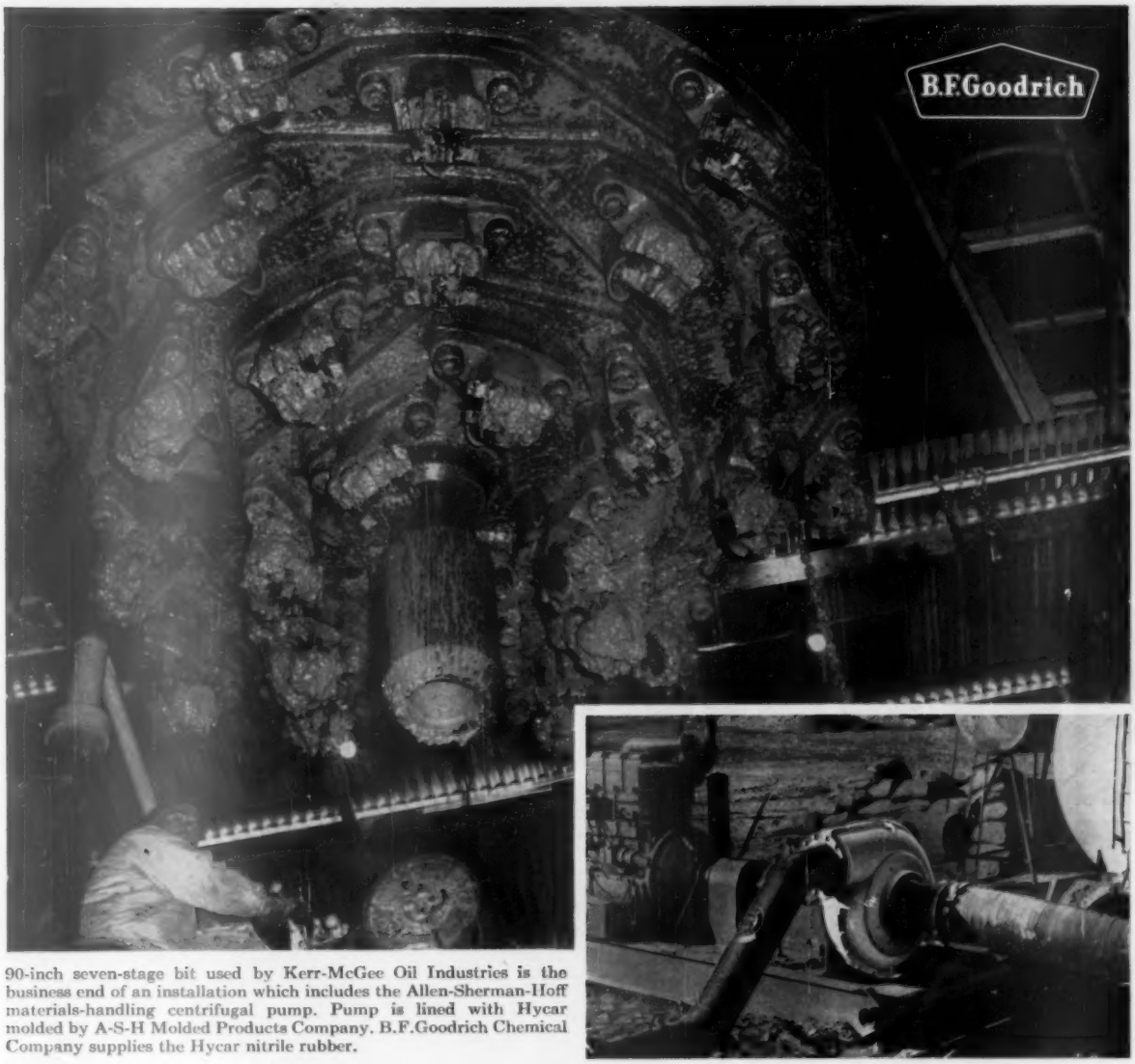

90-inch seven-stage bit used by Kerr-McGee Oil Industries is the business end of an installation which includes the Allen-Sherman-Hoff materials-handling centrifugal pump. Pump is lined with Hycar molded by A-S-H Molded Products Company. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

Hycar lined pump delivers 8,000 gpm of mud to giant-sized rotary drill

Oil field technology is giving a boost to another industry—mining—with this tremendous rotary drill. It is excavating a 90″ hole 700 feet deep, equivalent of moving earth from a 12″ hole 40,000 feet deep.

Providing a continuous mud supply is a real job—the centrifugal pump being used has a rating of 7,000 gpm with a discharge head of 110 feet. Up to 8,000 gpm are obtained in operation. The pump is lined with Hycar nitrile rubber—chosen to protect the pump housing against the torrent of sharp rock chips carried by the mud circulated during the drilling operation.

Hycar is often the choice for oil field jobs—it performs excellently under both high and low temperature conditions, it resists corrosion, chemicals and hydrocarbons in a manner unmatched by other rubbers. It will pay you to see that Hycar is used in all your operations. For more information, write Department MF-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

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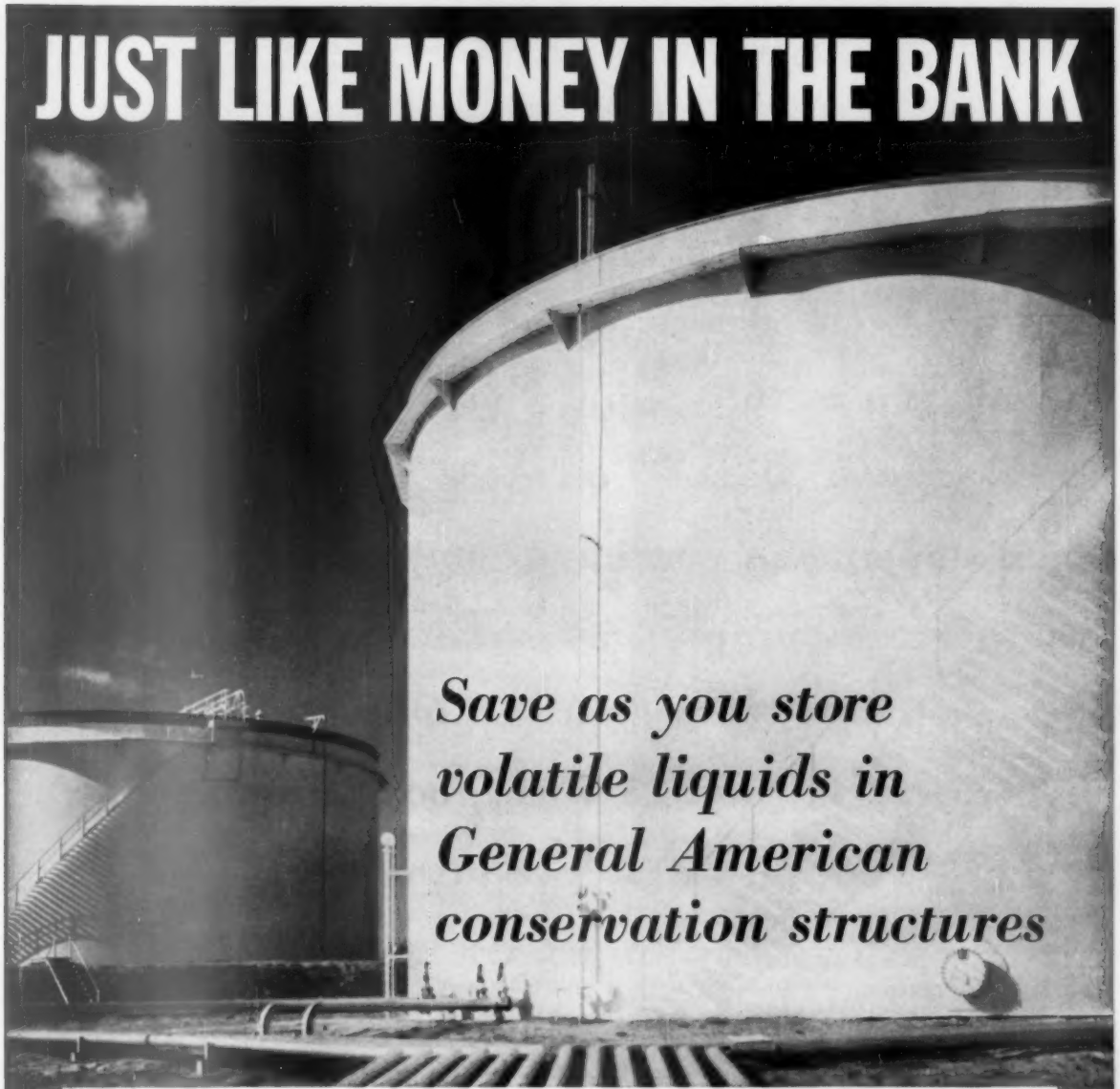


Save as you store volatile liquids in General American conservation structures

General American fabricates tanks with every type of floating roof, tanks with lifter roofs, dry-seal gasholders and vapor balancers that will pay for themselves with the product they save.

Two outstanding seals—the Wiggins Safety Seal, safest, surest seal you can buy, and EverSeal, a solid cushion seal especially made for "problem" liquids — are offered with the floating roofs.

Skilled field crews of General American and subsidiaries are available to erect these structures where you require them.

Write for General American Bulletin No. PW-1059 for descriptive details.

General American Floating Roofs
Hidek
Lodek
Double Deck
Annular Pontoon
Pan

General American Floating Roof Seals
Wiggins Safety Seal
EverSeal

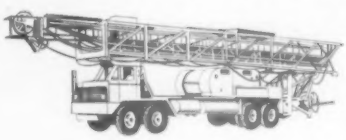
Other conservation structures
Lifter Roof Tanks
Dry Seal Gasholder
Vapor Balancer
Atmospheric Pressure-Refrigerated Storage Tank

Plate and Welding Division
GENERAL AMERICAN TRANSPORATION CORPORATION
135 South LaSalle Street
Chicago 3, Illinois
Offices in principal cities

The Man Who . . .

PULLS OIL WELLS OUT OF TROUBLE.

When you're in trouble you look for a friend that you can depend on . . . **just as oil men depend on servicing contractors to keep their wells pumping at top efficiency. And, experience teaches that the most dependable contractor is the one with good equipment . . .** like Franks . . . equipment engineered and built to keep the contractor as well as the producer out of trouble. **So, next time you are faced with servicing problems, look for** **proven dependability. Ask the man who uses Franks . . .** about the equipment that keeps him out of trouble.



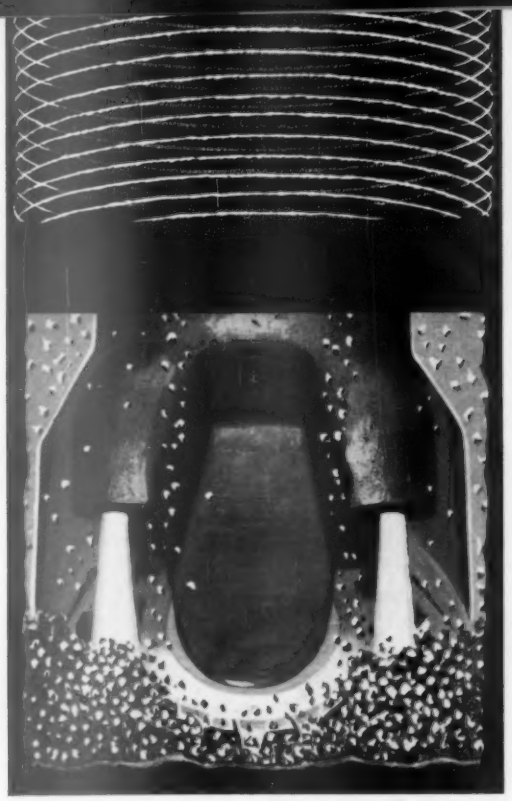
WELL SERVICING AND DRILLING UNITS

FRANKS

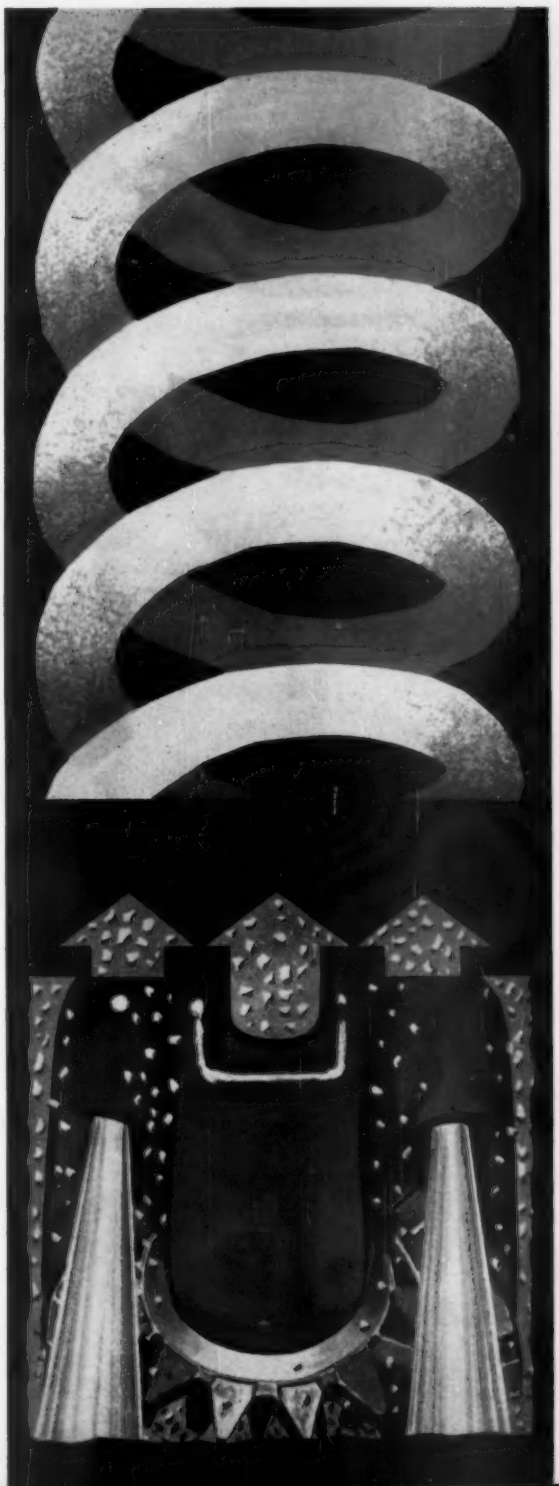
PAMPA, TEXAS

CABOT

CABOT CORPORATION
MACHINERY DIVISION



milling or drilling?



How can you tell if you're milling or drilling? It's easy. If you are using Reed Flush-Flo jet bits you **know** you're drilling ahead. Here's why—

1—The Flush-Flo ports allow an alternate route around the high velocity jets. Laboratory tests prove the Flush-Flo design allows the drilling fluid to sweep the entire bottom of the hole, whereas other jet type bits develop little fluid movement at the center.

2—Jet bits without Flush-Flo ports require all cuttings and circulating fluid to return past the high velocity discharge jets. Flush-Flo design provides up to 50% more return area, prevents re-circulating of cuttings, balling and re-drilling cuttings.

3—The Flush-Flo ports minimize hydrostatic pressure on the formation when running in the hole and minimize swabbing when pulling the string. These two factors afford maximum protection and minimum mud bills when drilling in lost circulation areas and leave wall cake and walls in better condition.

4—The flow pattern of the Flush-Flo jet bit provides less turbulence at the bit and affords greater protection in very soft formations.

The Flush-Flo design is an exclusive from the Reed research team—the most significant development since the advent of jet bits. The place to look for progress in drilling tools is right here at REED.

REED

DRILLING TOOLS × AIR TOOLS
ELECTRONICS

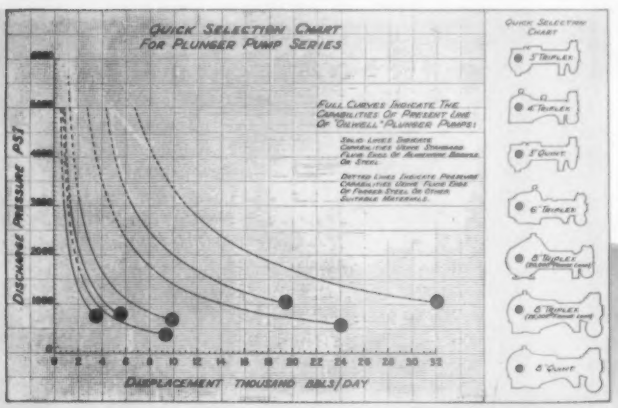
Reed Roller Bit Company, Houston 1, Texas • Export Office: Time and Life Bldg., Suite 3744 Rockefeller Center, New York 20, N.Y.

The "OILWELL" string...

PRODUCTS SERVICES STORES

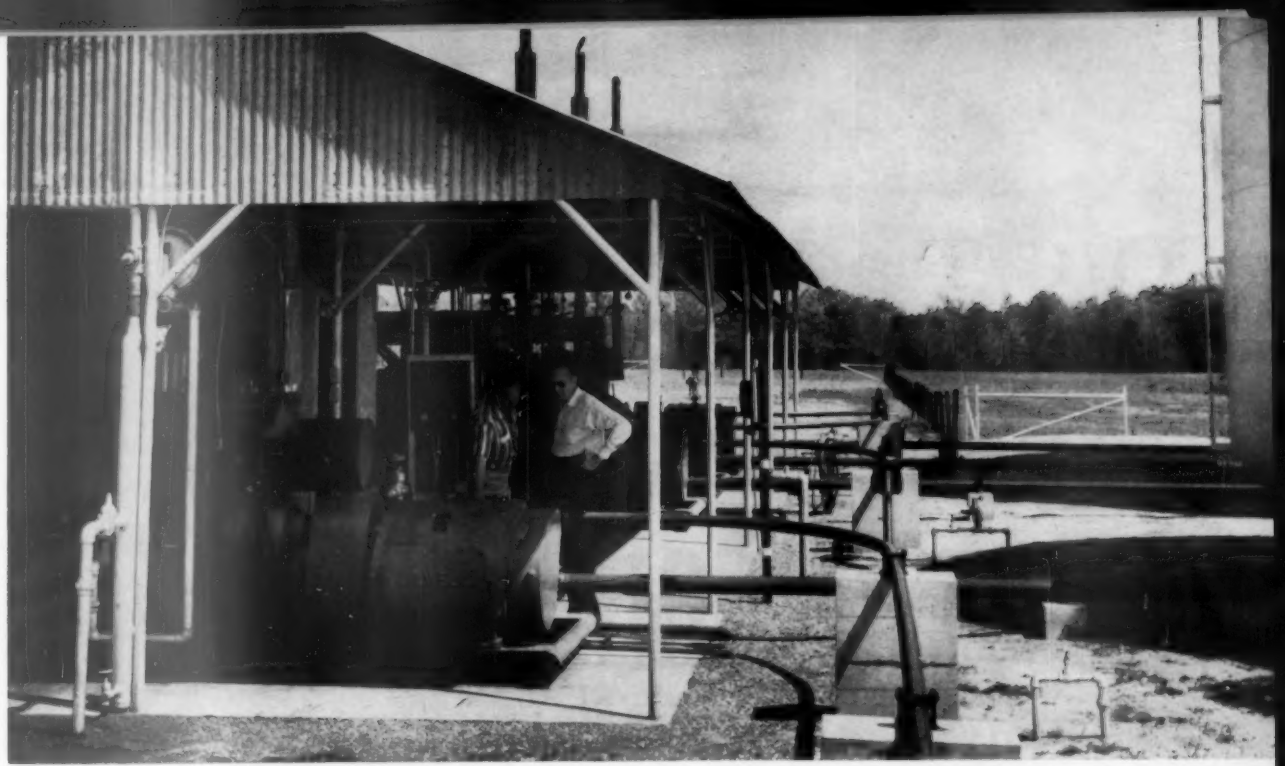
How to take the guesswork out of plunger pump selection

A mistake in horsepower, capacity, pressure requirements or suction and discharge piping arrangements can be costly. Here's a simple, nearly error-proof way of sizing the best plunger pump for your fluid-injection use—get your copy of "Oilwell's" new "Plunger Pump Selection Manual" without delay.


QUICK SELECTION CHART FOR PLUNGER PUMP SERIES
DISCHARGE PRESSURE PSI
DISPLACEMENT THOUSAND BBLS/DAY
QUICK SELECTION CHART

The manual describes in detail "Oilwell's" complete line of seven primary pumps. Volume-pressure range curves make it a simple matter to pick the pump that's right for the job. Picking plunger sizes is simple, too, because you'll find complete performance data for all plunger sizes available with each size pump. The selection manual also contains a wealth of other information including how to apply the pumps and how to size and arrange suction and discharge piping.

Write on your company letterhead for a free copy of "Oilwell's" Manual M29-1060. It's one of our ways of making sure that when you buy "Oilwell" equipment, you get a lot more than our product.



Why "Oilwell" waterflood pumps take it lying down

The pumps in the picture are operating in the New Odom field, and one of them has been pumping 24 hours a day for *eight months* without stopping. Naturally, it's an "Oilwell" pump and its design has a lot to do with its performance.

Every "Oilwell" plunger pump is designed horizontally for eight good reasons: *Low suction* . . . lowness of suction and discharge lines means maximum utilization of suction head and simplifies piping layout. *Less deadweight on crankshaft* . . . eases bearing loads, minimizes vibrational stress in frame and piping. *Simpler thrust transmission* . . . eliminates overhead yoke and pull-rod assemblies. *Cleaner installations* . . . any leakage is confined to frame cradle by gravity. *Natural valve motion* . . . fewer parts needed. *Low center of gravity* . . . reduces vibration that can cause piping stress and fatigue. *Safer maintenance* . . . does away with ladders and neck-craning. *Easier maintenance* . . . greater accessibility.

There's a wide selection of top-performing "Oilwell" Triplex and Quintuplex pumps for waterflood applications, LPG Flood, Pressure Maintenance, Formation Fracturing, Acidizing and Cementing, Salt Water Disposal, or you name it. Whatever your requirements, call on your "Oilwell" representative for complete information and help in the planning stage.

USS and "Oilwell" are registered trademarks

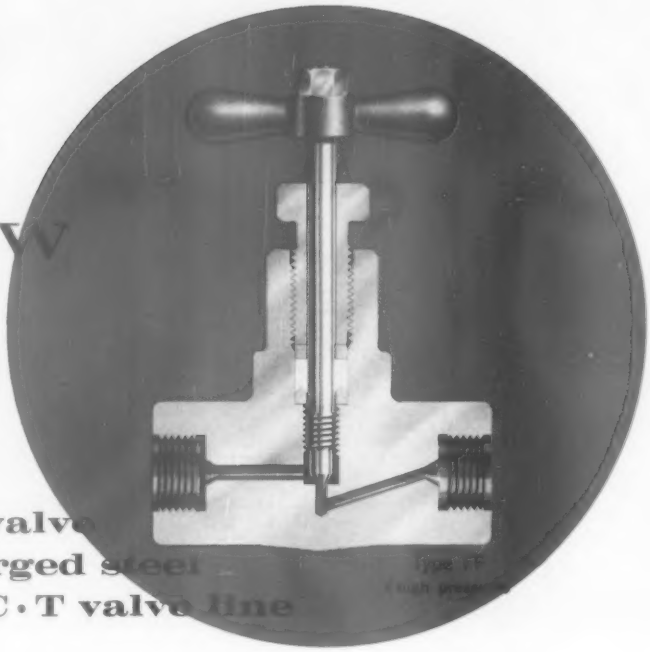
Off the shelf

It's all on the shelves in an "Oilwell" store, everything from subsurface pumps to mud gauges. Whatever you need in the way of production or drilling equipment, and whenever you need it, your nearest "Oilwell" store can take it off the shelf, load it, and it's no more than a short trip from your lease. That's because there are "Oilwell" stores, sales offices, warehouses and conversion centers (*and* pump shops) located *throughout* the oil country. If you're near oil, you're near an "Oilwell" store.

USS Oil Well Supply Division of United States Steel

Executive and Export Offices: Dallas, Texas

O·C·T adds a tough new NEEDLE VALVE



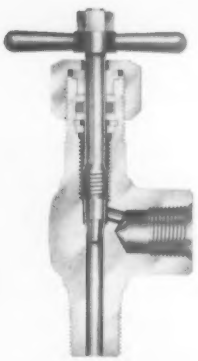
15,000-psi needle valve with one-piece, forged steel body added to O·C·T valve line

This new valve meets proposed new API specifications for use with test ports and pressure gauges. It has Teflon packing for ease of operation and maximum corrosion resistance.

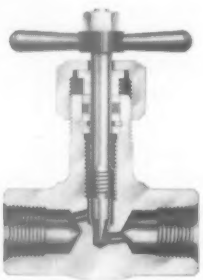
All O·C·T® needle valves have these important features that give you longer valve life and lower valve maintenance costs:

- **One-piece, forged steel bodies for rugged strength and maximum safety**
- **Durable stainless-steel needles**
- **Locking ring to prevent accidentally removing the needle assembly**
- **Needle valves specifically designed for Christmas-tree service**

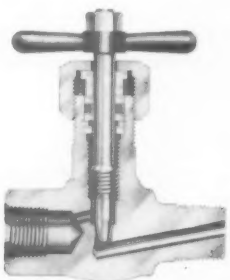
See your O·C·T representative now for further information and prices on the O·C·T line of long-life needle valves.



Type MFL



Type FF



Type MF

where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FMC CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas

YOU Asked for it...

and now it's here!

The New
COOPER TC-32
for Well Servicing to 6,000 ft. of 2½" Tubing

HERE ARE ONLY A FEW OF ITS MANY FEATURES:

- Cooper designed and built from the ground up especially for well service — single or double drum models.
- Highly portable in field — keeps up with highway traffic.
- Strong "I" beam frame.
- Diesel, LPG or gasoline engines to 200 h.p.
- Heavy duty synchromesh transmission with or without converter.
- Quiet running torque tube drives which eliminate high speed chains.
- Heavy duty axles front and rear.
- Air brakes on all wheels.
- One man cab equipped for driver comfort.
- Drum brakes with demountable heat treated alloy rims.
- Full air friction drum clutches.
- Drum shaft alloy steel mounted on spherical roller bearings.
- Optional control positions.
- Optional derricks or pipe masts.
- No license required most states.

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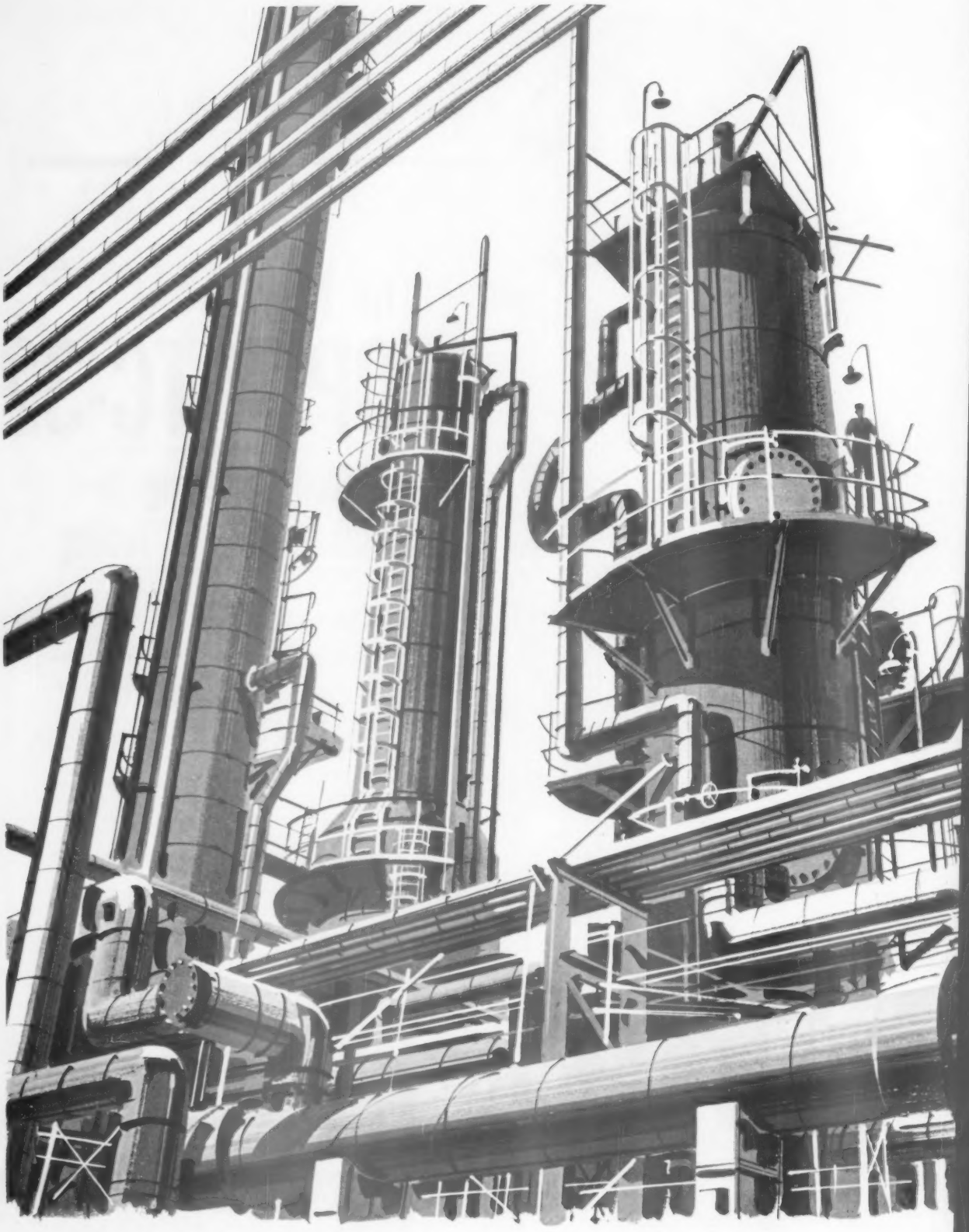
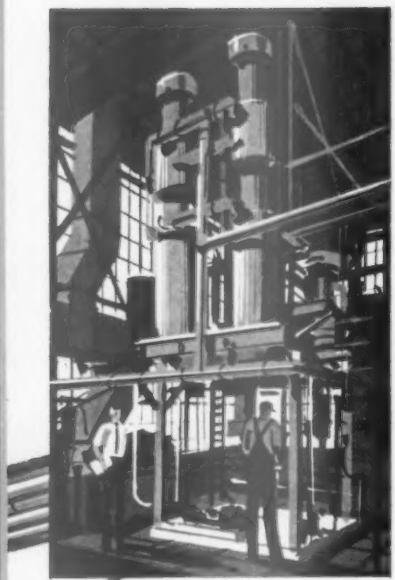
FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney, Edmonton



Foster Wheeler *Heat Engineered* products, plants and processes...for the world's industrial progress.



Scale-up the profit in your process

How can a processor scale-up a new process from pilot plant to large commercial installation and bring it to profitable operation without a long and costly start-up period?

The Foster Wheeler method is thoroughness. FW avoids or minimizes major stumbling blocks by careful attention to detail . . . by thoroughness firmly supported by careful organization and solid experience.

Examples are: the scale-up of a urea plant from 3 to 260 tons per day; a new FW deasphalting process from 1 to 10,000 barrels a day and a 300 ton per day ammonia plant that exceeded rated capacity 30 days after erection.

Whether for a proven process or scale-up project, FW gives you the thoroughness and experience you need—in design, engineering and construction—to build your process plant . . . any capacity . . . any process . . . anywhere in the world. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N.Y.

FOSTER FW WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

PARKERSBURG MAKES A SUCKER OUT OF ROD LIFTING 22,000 LB. LOAD

When they switched to Timken® tapered roller bearings on the wrist pins and pitmans in this pumping unit, Parkersburg Rig and Reel Company announced another first—a seal guaranteed for 200,000 hours operating service. Now the sucker rods can lift oil from the earth while the new seals keep oil in the bearings for the equivalent of over 20 years operation!

Timken bearings provide uniformly accurate bearing clearance settings to hold the shaft exactly on center with the seal. Dirt stays out, lubricant stays in. And with Timken bearings, Parkersburg could get tight fits on both cups and cones without complicating the assembly. Stress concentration is minimized because Timken bearings permit ample radius on the shaft. And the effective spread of Timken bearings gives maximum internal stability. If you buy or build oil field equipment, our experienced engineers will be glad to show you how Timken bearings can help you get maximum performance with minimum attention. The Timken Roller Bearing Company, Canton 6, Ohio. Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ont.

Industry rolls on

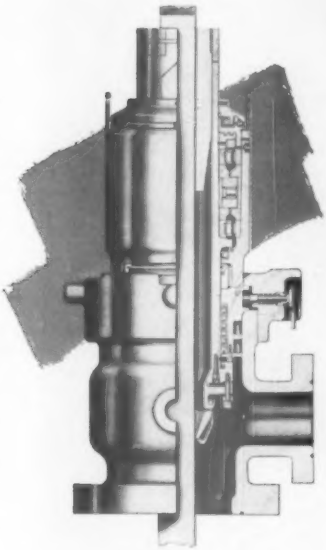
TIMKEN®

tapered roller bearings

DRILLING WITH **AIR?...GAS?...MUD?...REVERSE CIRCULATION?**

YOU SELECT THE METHOD...

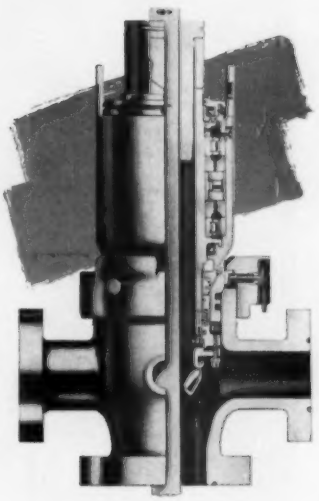
The SHAFFER ROTATING BLOWOUT PREVENTER and STRIPPER Gives FULL PRESSURE PROTECTION AUTOMATICALLY!



USE THE TYPE 50 FOR HEAVY-DUTY WORK
—including all types of drilling operations through 10¾" casing and larger!

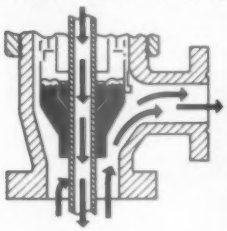
It's easy to see why the Shaffer Rotating Blowout Preventer and Stripper is the ideal pressure control solution to so many of today's advanced drilling techniques . . .

- Here's a unit that is *always* sealed off around the drill string as long as pipe is in the hole!
- It maintains its pressure-tight seal around *any* element in the drill string—square, hexagonal or octagonal kellys, flush joint, upset or coupled drill pipe, tool joints and drill collars (excepting, of course, such abnormally large diameter drill string tools as bits, reamers, scrapers and similar units).
- There's no delay when pressure emergencies threaten because the Rotating Blowout Preventer is *always* ready. No valves to open or close. No levers to operate. Nothing to remember—or forget—in emergencies!



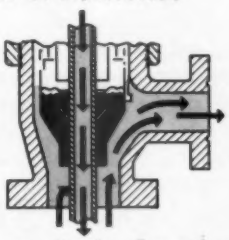
USE THE TYPE 51 FOR SLIM-HOLE DRILLING
—also for drilling-in, for production and re-work jobs, and for similar applications.

DRILLING WITH AIR OR GAS?



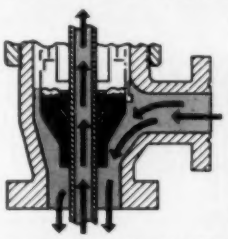
Operators are finding that many formations can be drilled faster, with longer bit life and increased production recovery by using compressed air or gas to replace the conventional mud column. Even wells in excess of 18,000 feet deep have been successfully drilled by this method, using the Shaffer Rotating Blowout Preventer and Stripper to seal around the drill string and maintain safe pressure control. The unit not only permits wells to be drilled more safely, but it also can readily be adapted to function as a casing stripper for pressure control while running casing, if desired. The 44 page brochure shown at right gives full details!

. . . AND FOR NORMAL OPERATIONS!



If yours are the more conventional drilling procedures, you still can do the job more efficiently and safely with a Shaffer Rotating Blowout Preventer and Stripper because this unit *automatically* adjusts itself to fit the varying diameters in the drill string without any attention from the operator. And even such abnormally large diameter drill string units as bits, reamers, and scrapers, can be readily passed through the Rotating Blowout Preventer without delay or inconvenience!

WHAT ABOUT REVERSE CIRCULATION?



This is another of the modern drilling techniques that provides important advantages in certain formations. Because the cuttings are returned through the inside of the drill string, higher fluid velocities are obtained at lower pump pressures (therefore lower pressures on the formations). Higher velocities lift larger cuttings, reduce need for coring, save costly rig time. Also, since larger cuttings are carried away faster, bit life is lengthened, drilling speed is increased.
These are advantages worth investigating...and here, again, the Shaffer Rotating Blowout Preventer and Stripper is the ideal unit to control circulation and maintain full pressure protection while drilling!

THIS HELPFUL 44 PAGE BROCHURE provides full data on operation and applications. It's free to qualified personnel, engineers and executives!

38 years OF OIL TOOL LEADERSHIP

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HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
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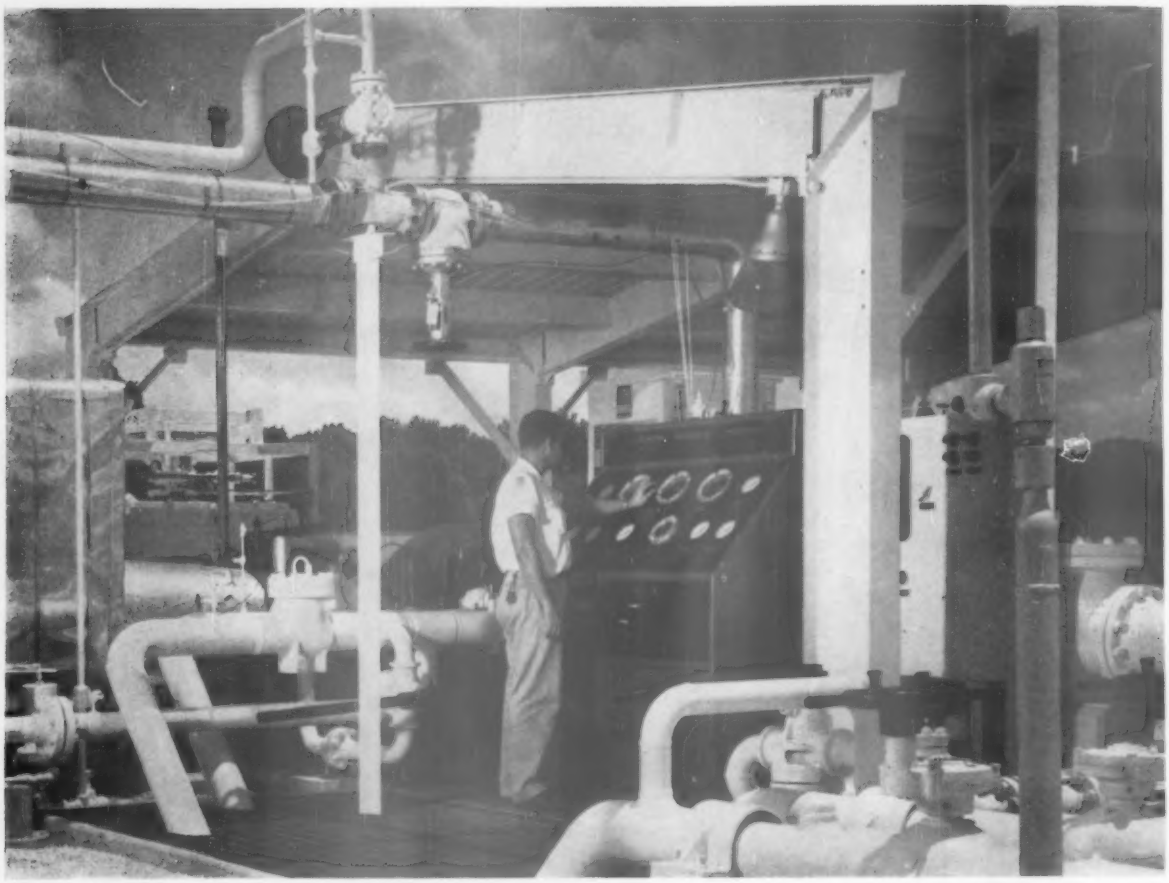


Trunkline uses Solar Gas Turbine compressor in pipeline station

Currently "on-line" at Trunkline Gas Company's Cypress, Texas, pipeline compressor station is an 1100 hp Solar *Saturn* gas turbine-driven centrifugal compressor set. In this application, it pumps up to 60 million cu ft of natural gas per day.

At Cypress, Trunkline is helping to pioneer a new concept: the use of a high-speed, turbine-driven centrifugal compressor in the low-volume range. Traditionally, reciprocating equipment has been the most practical in the range from 75 to 1000 inlet cu ft per minute at up to 1500 lbs pressure.

However, the availability of industrial high speed drivers, such as the Solar *Saturn* T-1000 gas turbine engine, has provided the impetus for Solar to design and build a line of efficient, long-life centrifugal compressors for this range.

The Trunkline installation is ⅛th the size of conventional compressor sets, costs an estimated ⅔rds as much to install and will run on a variety of fuels. At Cypress, for instance, the Solar compressor set runs on natural gas from the line. It would also run on gasoline, diesel fuel, kerosene or LPG fuels.

Another advantage of Solar compressor packages is the fact that a complete turbine-driven 1100 hp unit weighs less than 10,000 lbs and occupies under 300 cubic feet of space. It is easily portable.

Solar compressors are also ideal for field boosting. One *Saturn* turbine-powered set will deliver as high as 100 million cu ft per day. A unique modular concept of interchangeable compressor staging allows quick, easy field changes to accommodate changing pressure and flow requirements.

Solar's industrial turbomachinery is designed for rugged use. Solar turbines start instantly without warm up and are ideal for remote or unattended operation. Ranging from 50 to 1100 hp, they can deliver more power per pound than conventional engines for pumping, electric power generation, oil well servicing and other prime mover requirements.

For more information about Solar turbomachinery, write Dept. J-133, Solar Aircraft Company, San Diego 12, California.

SOLAR

A subsidiary of International Harvester Company

There's business out there.

You're looking at more than a horizon. It's a future, yours and America's. Out there is Europe and Latin America and Asia and Africa. But in 1960, of all U.S. manufacturers, less than 5% saw these foreign shores for what they are worth: a 19-billion-dollar export market, a vast source of foreign trade.

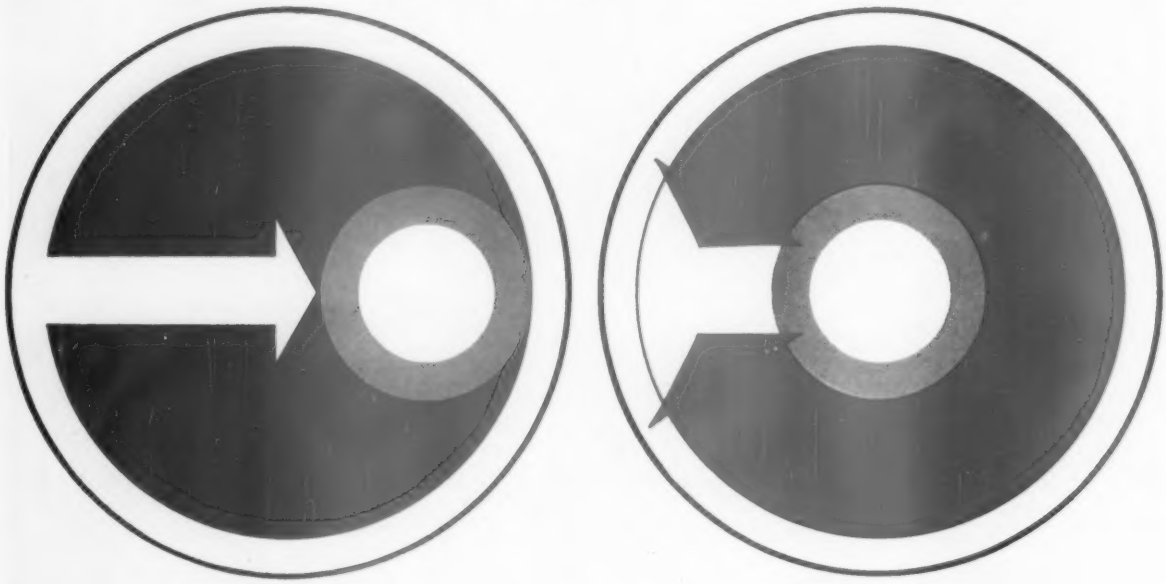
Move in for your share. Build your business and help keep America growing. Extra production creates more jobs, helps balance the outflow of gold, and wins new friends abroad with U.S.-made products.

Even if you've never sold overseas, you have a rare opportunity to start—now. Your U.S. Department of Commerce will help with counsel by experts on what, where and how to sell—with data on credits, payments and financing. A package of invaluable know-how is yours for the asking.

Now's the time to discover the many ways in which your business can grow. In the lucrative export markets. In new U.S. markets. In developing new products. In attracting new industry to your community. Just write or phone the U.S. Department of Commerce Office of Field Services in your city, or Washington 25, D.C. They are ready to help you grow with America!

NOW'S THE TIME TO GET GROWING IN A GROWING AMERICA!

NEW PIPE-LAX IS THE WORLD'S BEST STUCK PIPE INSURANCE



When pipe is stuck . . .

Pipe-Lax gets it free.

IT SOAKS PIPE FREE

Now, from Magcobar research, comes the new way, the economical way of freeing stuck pipe. With new Pipe-Lax, an organic chemical concentrate, most losses of time, money, and patience because of stuck pipe and collars can be eliminated. In extensive field applications, Pipe-Lax has been used to free stuck pipe with better than 85 percent effectiveness! It is so inexpensive, it can be used whenever you have sticking problems.

For the best insurance available against the high cost of fishing for stuck pipe, keep a drum on your well. The sooner you use Pipe-Lax for freeing stuck pipe, the better your chances are of saving an expensive fishing job. Contact Magcobar today for complete details.

Magnet Cove Barium Corporation, Houston, Texas.

Magcobar
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

Well Done with Magcobar Technology

ALL FLOATING ROOF TANKS ARE FULLY EQUIPPED, **BUT...**

Only Tubeseal Has Lightning-Proof, Electro-Conductive Weather Shield

PATENTED

Tubeseal electro-conductive weather shields are an *exclusive tried and proved development.* They provide positive protection against lightning-caused rim fires. ■ How? By maintaining a *continuous* grounding bond between roof deck and shell—concentration of static charges is impossible. There has *never* been a lightning fire where any of the many hundreds of Tubeseal System Floating Roof Tanks are installed throughout the world—they're "lightning proof." ■ This is scientific and safe storage protection for the entire range of volatile products. Tubeseals can be installed on any of your tanks—new, old, riveted, or welded. You owe it to the future safety of your conservation facilities to investigate. Send for the Tubeseal Bulletin now—it could be important.

PDM

Pittsburgh-Des Moines Steel Company

12 plants to serve you coast to coast

HAMONDTANK

PITTSBURGH, WARREN, BRISTOL, PA. • BALTIMORE • BIRMINGHAM • DES MOINES
PROVO, UTAH • CASPER, WYO. • SANTA CLARA, FRESNO, STOCKTON, CALIF.

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For casing, liner, 3 squeezes—UNAFLO cement all the way!

Forest Oil Corporation, San Antonio, Texas, reports successful completion of M. O. Miller #13 Well, Cameron Parish, La., with UNAFLO retarded oil-well cement. Contractor, Ward Drilling Co., Lafayette, La., ran a string of 7" casing through 10¾" pipe set at 3,500' in 9⅞" hole to 12,416', then cemented with 1,000 sacks of neat UNAFLO cement – slurry weight 16 lbs./gal. Prior to cementing, mud was circulated one hour; wt. 12.3 lbs./gal., visc. 58, log. temp. 216°F. Est. static B.H.T. 248°F.

307' of 5" liner then run to 12,612' on drill pipe and cemented with 110 sacks neat UNAFLO. 40 sacks reversed out from above liner packer after it was set. Mud wt. 13 lbs./gal., visc. 50, water loss 3.1, log. temp. 232°F. Est. static B.H.T. 267°F. Top of liner held 5,000 psi test.

On the first squeeze job, 7" casing perforated 11,824' to 11,828'. Squeeze tool set at 11,750'. Formation breakdown occurred at 4,600 psi. 100 sacks neat UNAFLO mixed, 70 sacks out in formation under 6,000 psi, 30 sacks reversed from the well. Squeeze held dry test.

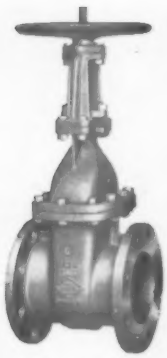
Second squeeze job saw 5" liner perforated at 12,470' to 12,505'. Drill-stem test showed gas and salt water. Formation breakdown at 5,600 psi. 100 sacks neat UNAFLO preceded by 500 gal. acid. 85 sacks forced into the formation under max. pressure of 7,100 psi.

Third squeeze job, same perforations. Formation breakdown at 5,000 psi. 100 sacks neat UNAFLO mixed with 76 in the formation under 6,900 psi. Zone failed to produce oil and well was completed in upper sand.

More producers rely on UNAFLO used neat or with admixtures for cementing casing or liner, squeeze jobs, plugbacks or recementing. That's because UNAFLO pumps easily and sets hard to provide an adequate seal. Its retarded set sustains high initial fluidity despite high temperatures and pressures. For information, write Universal Atlas, 100 Park Avenue, New York 17, New York.

"USS" and "UNAFLO" are registered trademarks U-165

Universal Atlas Cement
Division of
United States Steel



In this **Split Wedge Gate**

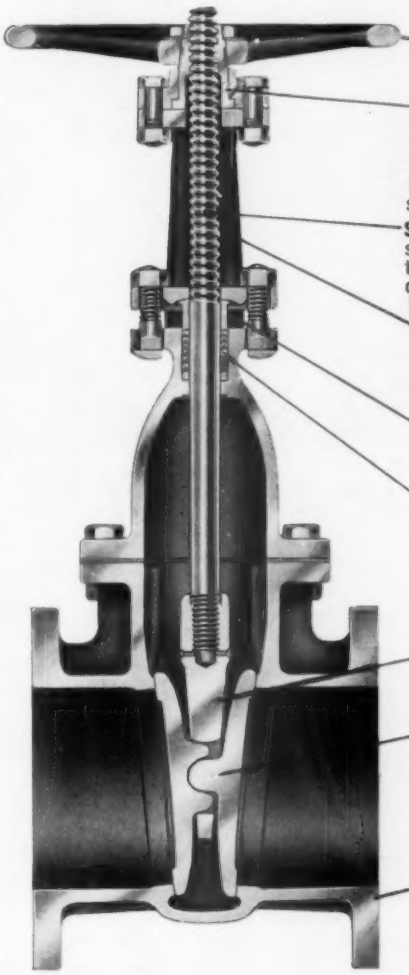
you can see why it pays to

Specify JENKINS for STAINLESS STEEL Valves, too

This picture shows the many points of excellence in the design and construction of Jenkins Fig. 1327 Split Wedge Stainless Steel Gate Valves. Compare them with any valve you know. You'll conclude that it's hard to beat Jenkins at making valves, no matter what the material.

But no picture can show the quality of the castings . . . the precision machining . . . the rigid inspection and testing that have gone into this valve. All of these are as important as design and metal alloys in assuring long, dependable, economical valve service. And, all of them are up to the peak standards for which Jenkins has been known for almost a century.

SEND FOR NEW CATALOG of Jenkins Stainless Steel Valves. You'll find in it the patterns you want, in a choice of alloys that satisfy the requirements of practically all corrosive services. Also, you'll see that these Jenkins valves meet valve industry specifications and the high standards established by the leading users of stainless steel valves. Jenkins Bros., 100 Park Avenue, New York 17.



WHEEL of high strength malleable iron designed for firm grip and easy operation.

YOKE BUSHING, easily renewable. Made of bronze, for ideal thread engagement with stainless steel spindle, to prevent seizing or galling of spindle threads. Bushing of stainless steel is optional.

SPINDLE has long thread bearing surfaces with correct lead for easy, tight closing. Screws into wedge carrier, then secured by a stainless steel pin.

YOKE BONNET has liberal space between yoke arms for easy access to packing box. Precision machined flange face assures uniform contact with gasket for a tight body-bonnet joint.

GLAND consists of two pieces — gland flange and gland follower — eliminates binding of follower in case gland bolts are tightened unevenly.

PACKING of Chevron-type Teflon in large packing box prevents leakage. Only a minimum load is required on gland, extending service life of packing.

WEDGE CARRIER connects wedge to spindle and raises or lowers it. Husky in size to stand any operating strains.

SPLIT WEDGE is the ball-and-socket design which automatically adjusts to the tapered seating surfaces for positive shutoff. The discs, revolving freely in the wedge carrier, produce a self-cleaning action on seating surfaces and reduce possibility of galling and seizing.

BODY — Through-port design for full, free flow. Ample wall thickness and good design provide extra strength to withstand stresses. End flanges conform to M.S.S. specs.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

Sold Through Leading Distributors Everywhere

JENKINS BROS., 100 Park Avenue, New York 17, N. Y.

☐ Send the new stainless steel valve catalog

☐ Have a representative call on me

NAME & TITLE.....

COMPANY.....

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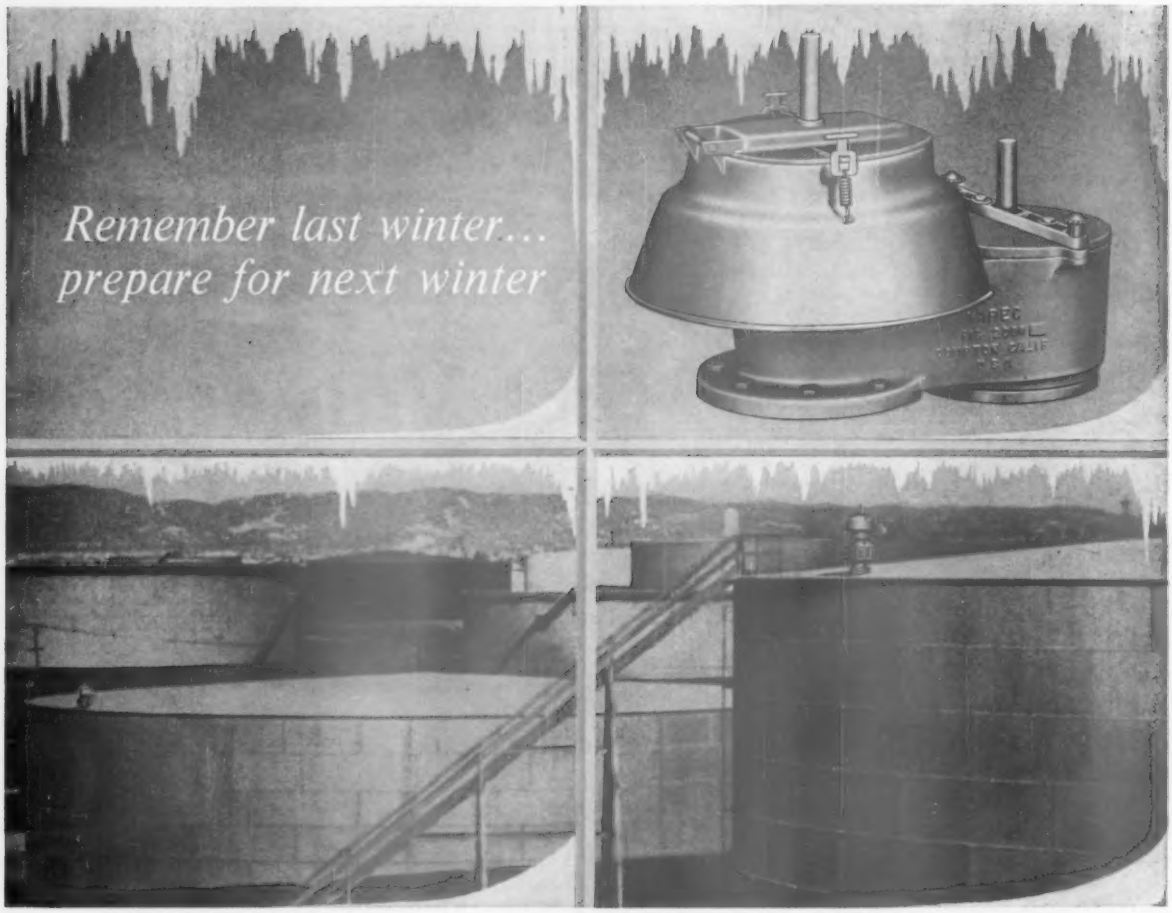

MODERNIZE YOUR TANK FARM NOW

with the new Varec All-Weather Breather Valve that works perfectly in -60° winters and +125° summers.

Here's all-weather performance that's been *proven* through two full years of Eastern Canada's roughest climate...frigid winters...hot, humid summers. Yet never once did Varec's rugged new Fig. 2000-61 ALL-WEATHER Breather Valve fail to operate perfectly. What's more, this petro-chemical plant can look forward to the continuation of this 100% performance for many tough seasons to come.

By modernizing your tanks with this new Varec ALL-WEATHER Breather Valve, you are now assured of tank safety and vapor saving efficiency *the year around.*

NEW FIG. 2000-61 MODEL...
TWO-WAY PROTECTION AGAINST FREEZE-UP.

Here's how Varec engineers have solved the cold-weather problem: First, both pressure and vacuum pallets utilize a flexible diaphragm of special non-frosting, icing-resistant material. This eliminates possible freezing between pallet and seat ring.

Second, a special non-frosting, icing-resistant compound is used to coat the pallet perimeter and stem, guide-posts and tip of seat ring. Ice and snow scrape free when the pallet lifts.

For complete information on the Varec Fig. 2000-61 ALL-WEATHER *Breather Valve, write for Varec Bulletin No. CP-2701, Dept. OGJ-1500-4.*

Varec™
TRADE ® MARK

THE VAPOR RECOVERY SYSTEMS COMPANY
2820 North Alameda Street • Compton, California

Branches and Representatives in Principal Cities

NEW CHIKSAN SPRING BALANCED LOADING ARM—

Here is a series of loading arms that is built to deliver solid performance right around the calendar. Outstanding new compression spring design offers finger-weight flexibility, yet the arm will not creep or sag when released. Springs are housed in a sturdy weatherproof steel case. Balance adjustments are accomplished with a hand wrench. The swivel joints on the arm have the dependability that has been associated with the name Chiksan for 30 years. Get the facts. Write for Bulletin 1-61.

FEATURING NEW TOTALLY ENCLOSED COMPRESSION SPRING—

Self compensating spring tension provides complete balance at any position. Compact design. No protruding brackets or counterweights.

4 MODELS FOR PETROLEUM SERVICE

Select from a complete line. All models —Folded Arm, Sliding Sleeve (shown above), Bottom Loader and Long Reach are available in 2, 3, and 4-inch sizes. Each model is a complete, ready for service, unit.

2 MODELS FOR CHEMICAL SERVICE

For loading or unloading virtually any chemicals, Chiksan offers a standard group of arms equipped with its DS series swivel joints. Available in Folded Arm model or Sliding Sleeve unit (shown at left).

WANT TO CONVERT EXISTING EQUIPMENT?

Chiksan Base Arm Sections permit operators to change existing facilities with minimum effort. Base Arm Sections are available in standard sizes of 2", 3", and 4". Riser joint supplied with threaded or flanged connections.

MAIL COUPON TODAY FOR COMPLETE INFORMATION

CHIKSAN fmc

#61-60

CHIKSAN COMPANY
330 North Brea Blvd., Brea, Calif.

Please send me your Bulletin 1-61.

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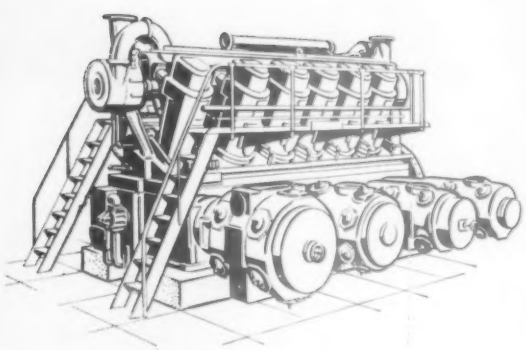
"MAMMOTHS and MICROMETERS"—



A 150-ton turbocharged gas engine, or a quarter-ounce leaf spring for a Channel Valve — both are made with the same perfection of detail at Ingersoll-Rand's newly-expanded gas-engine compressor plant at Painted Post, N. Y.

No component is too large or small to get the full treatment of Ingersoll-Rand's exacting quality control, from foundry to assembly floor. Usually it's the "tremendous trifles" that lead to troubles

Quality is maintained by careful inspection at each stage of manufacture. Here, Channel Valve springs are being checked for correct tension.

In the Painted Post foundry, alloy steel of special formulation is poured into molds for compressor cylinders.

Optical glass and ultra-violet light rays check hyper-pressure compressor valves for absolute flatness.

extra precision builds longer life into your engine-compressors

in the field. But here at Painted Post, nothing is taken for granted — every item is checked and double-checked. Every detail must meet I-R standards of quality and performance, for any machine is only as dependable as its weakest part.

The Painted Post plant is the largest and most modern engine-compressor manufacturing facility in the world. Your Ingersoll-Rand engineer will be glad to arrange a factory tour so you can see for yourself the extra precision built into every I-R 4-cycle V-angle engine-compressor — from the 120-hp JVG to the 4500-hp KVH.

Ingersoll-Rand

240A6 11 Broadway, New York 4, N. Y.

The World's Most Comprehensive Compressor Experience

Positive Bit Control with Fuller Transmissions

Failing's Model FP-3 Rig is designed to handle 20-foot drill pipe and give pressures up to 30,000 pounds applicable to the bit.

One of the outstanding advantages of the George E. Failing Company's FP-3 Rotary Drill Rig is the absolute control it maintains over its bit through the use of a Fuller 10-FA-65 Transmission. This versatile transmission gives the bit ten forward and two reverse speeds. "We are well pleased with the performance of Fuller Transmissions on our FP-3 Rig," Everett Carley, Failing's Chief Engineer says. "The unit is well engineered and gives steady, dependable service."

Completely portable, Failing Rigs may be operated from a truck, trailer, crawler or skid. They are made in various sizes and models and have depth capacities ranging from 100 to 7,500 feet. The FP-3 drills to 2000 feet and it operates equally well with air or fluid circulation. It uses down-the-hole hole percussion tools in extreme hard-formation areas and conventional rotary rock bits in other areas. The rig is recommended for drilling blast holes, waterwells, petroleum exploration and production drilling.

Ask about the Fuller Transmission designed to build more profitable performance into your operation.

FULLER TRANSMISSION DIVISION

EATON MANUFACTURING COMPANY

KALAMAZOO, MICHIGAN

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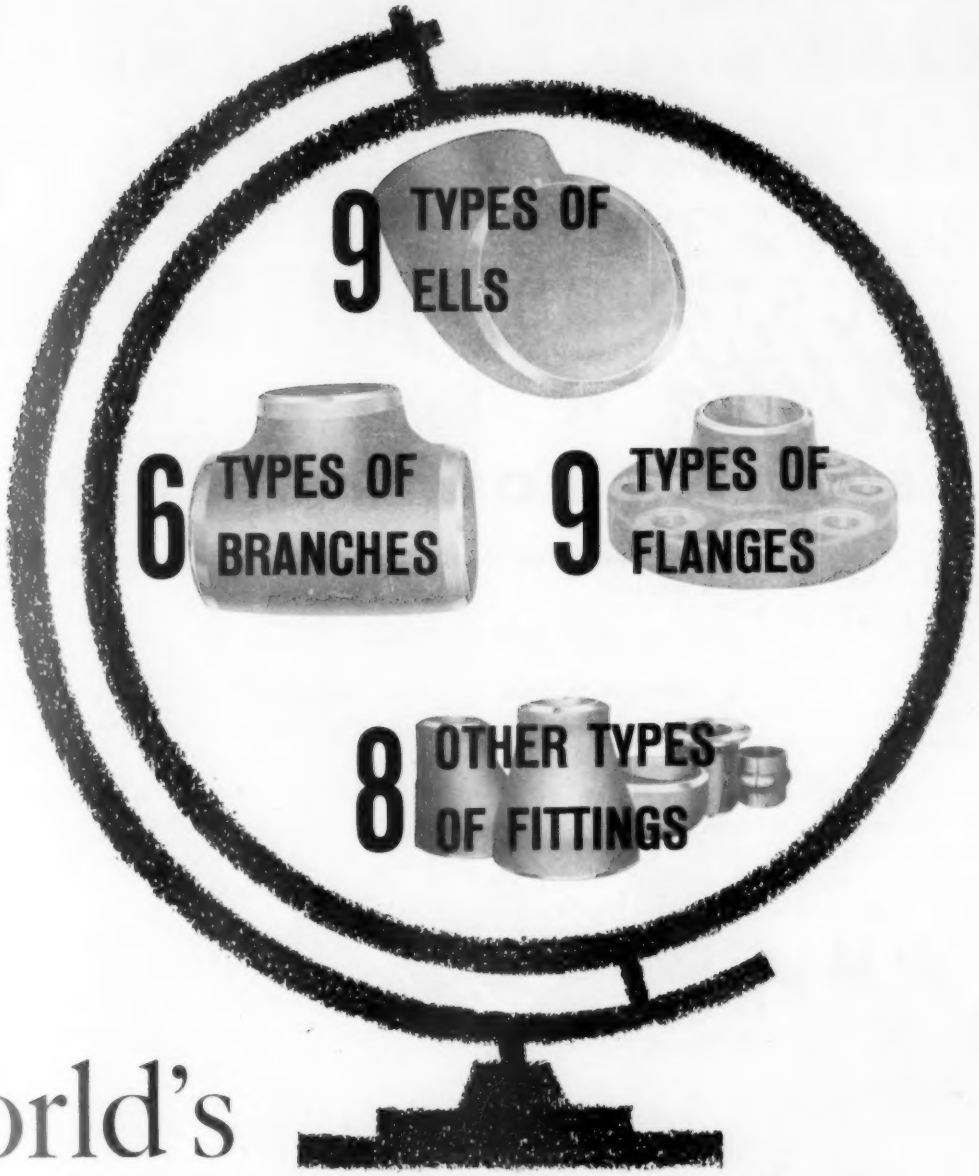


World's Most Complete Line

Here is a single complete source for all fitting and flange requirements. Each of the basic types (shown above) is available from stock in a wide choice of diameters, wall thicknesses and metals. From this unlimited fund of seamless and welded fittings and forged flanges, you'll find exactly what you need.

Midwest also maintains facilities for the production of special fittings and flanges in any configuration, size, wall thickness and metal.

Stock fittings are carried by distributors from coast to coast. Contact your local distributor for all your fitting and flange requirements.

MIDWEST PIPING

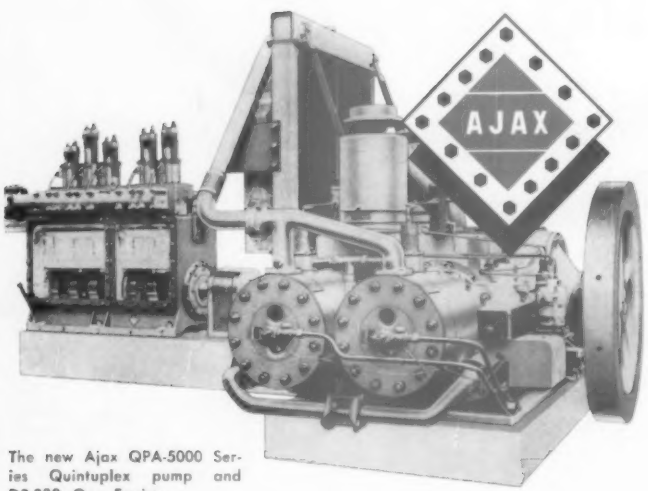
6107

A Division of Crane Co. • 1450 South Second St. • St. Louis 4, Missouri

AJAX Gives You DEPENDABLE OPERATING AUTOMATION

With BUILT IN POWER SUPPLY

- Stark simplicity of operation and servicing — you don't need a specialist.
- Control engine speed to load and water requirements.
- Engineered to actual horsepower requirements without destructive overload capacity required by instantaneous starting demands



The new Ajax QPA-5000 Series Quintuplex pump and DP-230 Gas Engine

The need for dependable electrical power still remains one of the weak links in the usual automation installation — especially in remote locations and under certain climate conditions.

Ajax time proved engineering has now solved many of the automation-electrification problems. Automation today is economically sound if the equipment and the installation are designed to meet your particular problems. Contact your Ajax distributor today for the full story on automation without external electrification.

Ajax gives you true economy because of simplicity of design, ease of maintenance, extra long life, and 83 years of quality craftsmanship experience.

AJAX ENGINES AND PUMPS

AJAX . . . also builders of COMPRESSORS

AJAX IRON WORKS CORRY, PENNSYLVANIA

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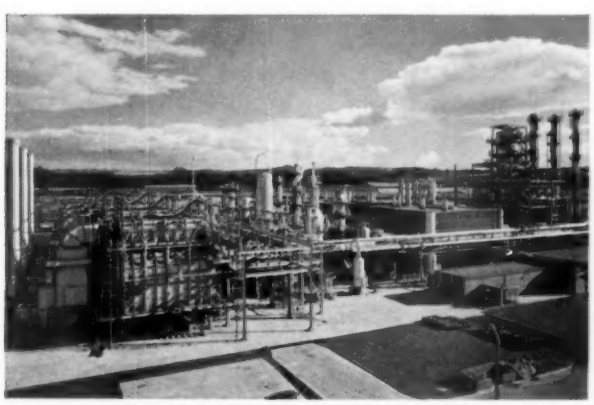
STONE & WEBSTER CONSTRUCTS A SCOTTISH GIANT

FOR BRITISH HYDROCARBON CHEMICALS LIMITED . . .

Completed ahead of schedule in June, 1960, Number 3 Ethylene Plant for B. H. C. at Grangemouth, Scotland was designed and constructed by Stone & Webster Engineering Limited. The new plant is one of the largest ethylene units outside the United States.

The plant employs the Stone & Webster process reflecting cumulative experience gained over a period of years from the design of over 36 ethylene plants processing a wide variety of feed stocks. Maximum stream time, heat economy, simplicity of operation and minimum maintenance are basic to this process. We would welcome the opportunity to review how our skills and experience could prove profitable to your next engineering project.



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AFFILIATED WITH STONE & WEBSTER ENGINEERING LIMITED (LONDON)

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N E W—from Johnston Testers

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to give you a
sharper view of
the subsurface . . .

. . . engineered by the people who invented drill stem testing and brought the art to its present state of perfection.

This new, deep-penetrating Engineering Analysis facilitates computation of hydro-dynamics, provides indicated permeability and presents an analysis of well bore damage.

At modest cost, this comprehensive report will relieve your engineering staff of laborious detail work. You will find **Insight Analysis** invaluable in avoiding the risk of passing up a producer.

For more information about this new service, call Johnston Testers in your area, or write:

A WORLD OF EXPERIENCE

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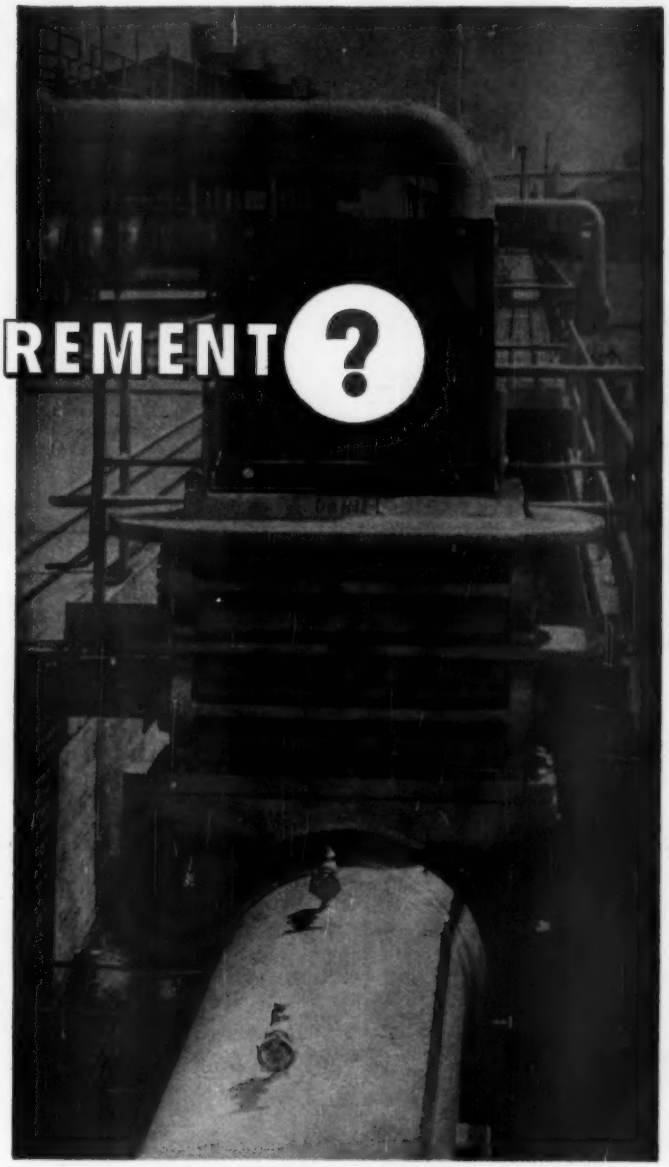
HAVE YOU THE EDGE IN MEASUREMENT?



Daniel 30" Senior Orifice Fitting on mainline gas measurement.

Accuracy in flow measurement, from orifice signal to final read-out, depends on many elements. Anything less than the best available system accuracy is too expensive.

The simple orifice plate, a most widely used primary device in measurement, is actually a precision instrument. At Daniel, experienced craftsmen turn out plates, from ¼" to 60" O.D., which better industry standards.

Simplicity of operation and stainless steel trim of Daniel Orifice Fittings are recognized, by measurement men everywhere, as guarantees of better service.

Meter Tubes from Daniel, of special seamless tubing, free from imperfections, provide closest tolerances for the most precise metering applications.

Now all the elements for precision metering are combined into an easy-to-order Daniel Packaged Meter Station.

These custom-designed units provide savings in field assembly costs, reduce order and delivery time, and permit full salvage when desired.

To have the edge in measurement, see your Daniel representative soon, or write direct for full information. You'll be glad you did.

from Orifice Plates to complete Packaged Metering and Regulating Stations Daniel Products are made to Measure!

DANIEL ORIFICE FITTING COMPANY

P. O. BOX 19097 HOUSTON 24, TEXAS HO 5-3451

Los Angeles, Calif. • Odessa, Tex.
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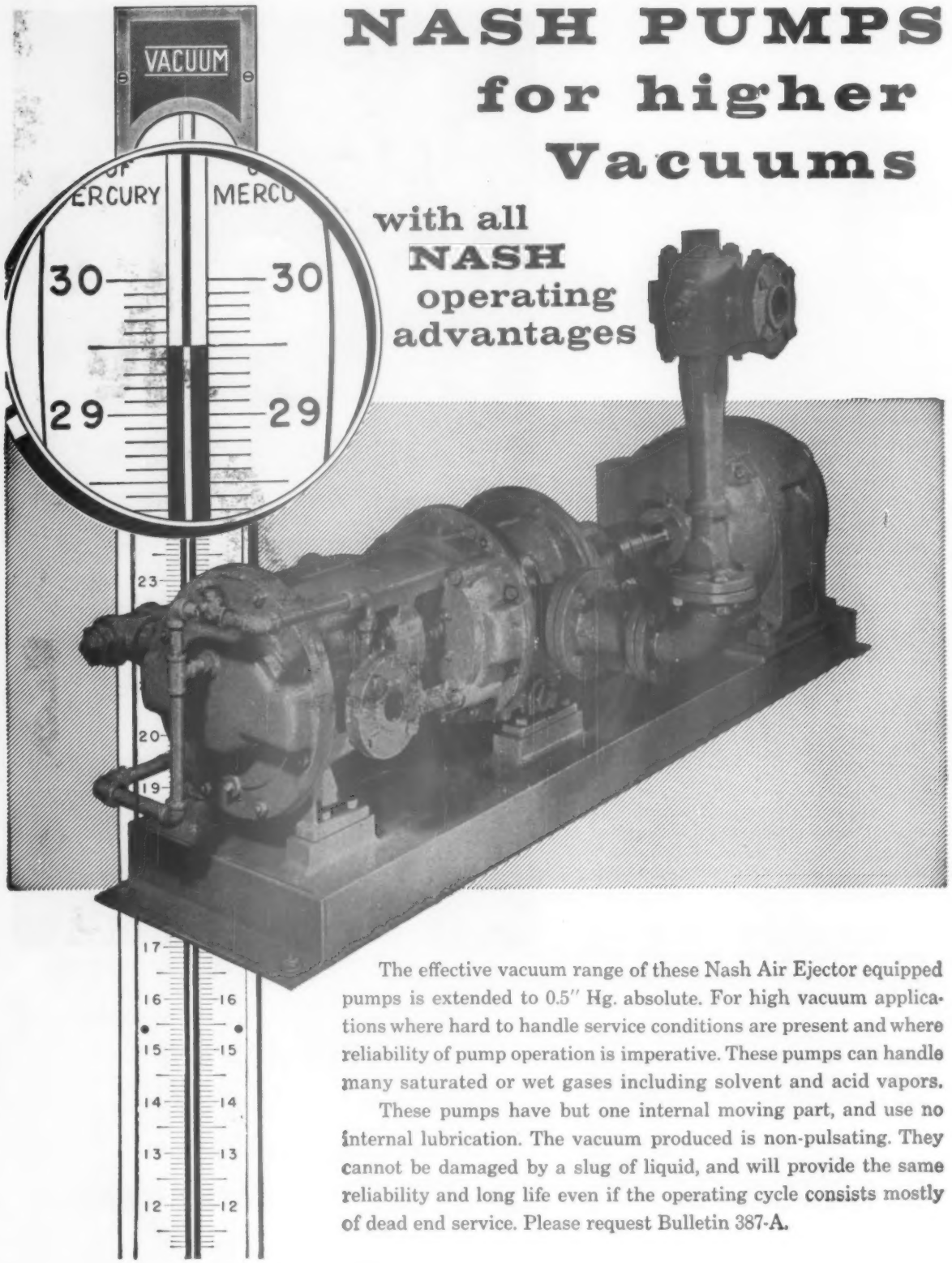
NASH PUMPS for higher Vacuums

with all NASH operating advantages



The effective vacuum range of these Nash Air Ejector equipped pumps is extended to 0.5″ Hg. absolute. For high vacuum applications where hard to handle service conditions are present and where reliability of pump operation is imperative. These pumps can handle many saturated or wet gases including solvent and acid vapors.

These pumps have but one internal moving part, and use no internal lubrication. The vacuum produced is non-pulsating. They cannot be damaged by a slug of liquid, and will provide the same reliability and long life even if the operating cycle consists mostly of dead end service. Please request Bulletin 387-A.

NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

"We've been using Edward Mudwonder Valves for six years . . ."

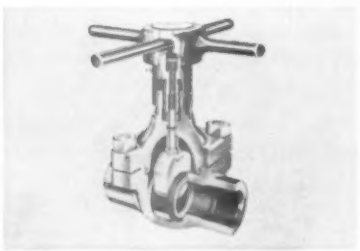
SAYS HOMER SMITH,
MARINE SUPERINTENDENT,
M & M DRILLING CO.,
HOUSTON, TEXAS

"Inshore drilling is our speciality. We've been drilling all over the Louisiana Gulf-Coast for over twenty years.

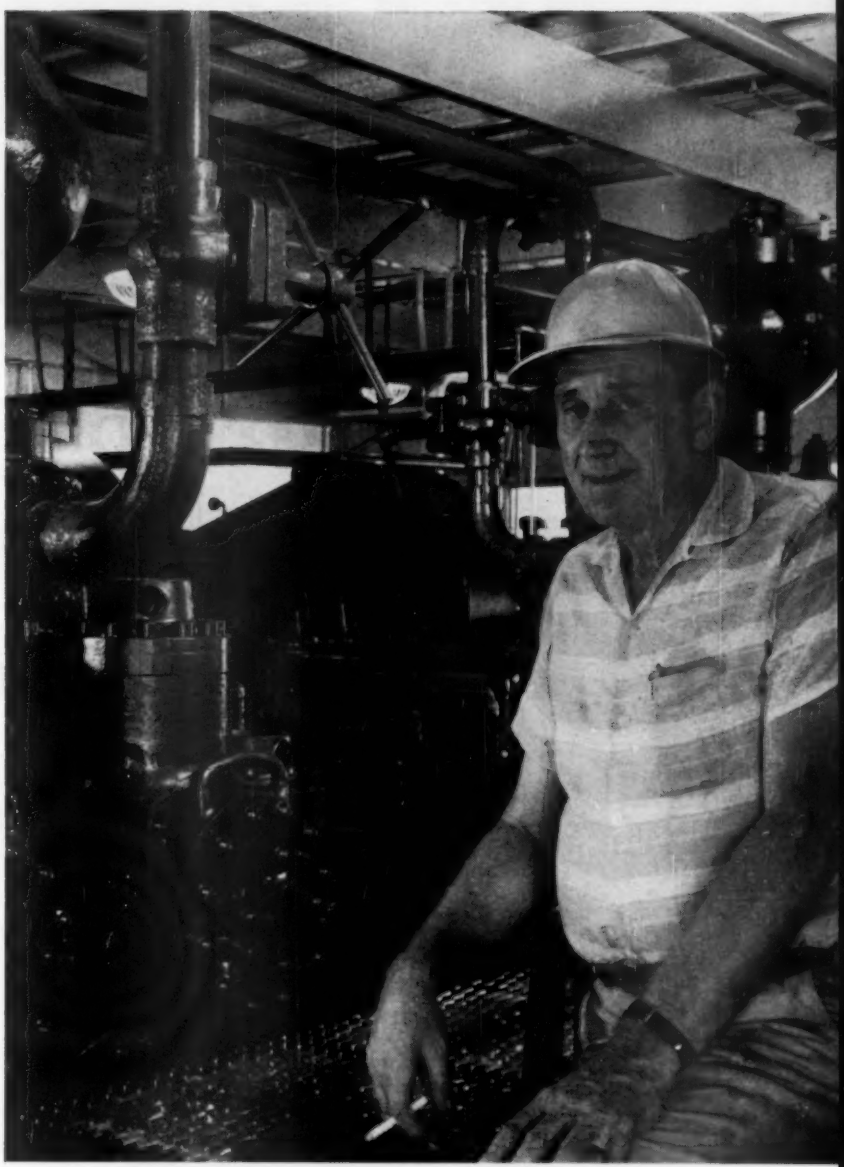
"As you can see from our new Barge #2, we have no small investment in equipment. This new diesel electric barge, for example, was specially designed with a raised deck. It's capable of drilling in 18 feet of water compared to the usual 12 feet for rigs of this type. And we can go down to 20,000 feet,so we are ready for any assignment that comes along.

"Naturally, when you work with equipment like this you want to go first class all the way. That's why we've been using Edward Mudwonders for the past six years and why we use them on Barge #2."

M & M Drilling Company's confidence in Edward Mudwonder valves is part of the drilling industry's growing concern for improved technology and economy. Mudwonder valves are built in 2", 3" and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test), 3000 psi WP (6000 psi test) and 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6022

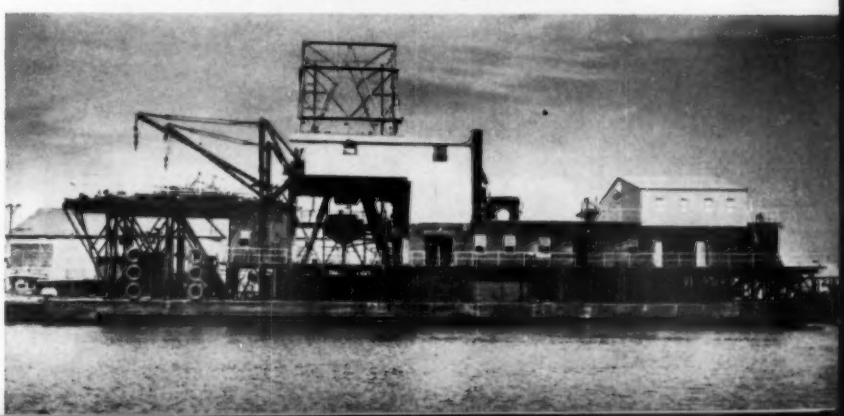


EDWARD STEEL VALVES
another fine product by
ROCKWELL



▲ Marine Superintendent Homer Smith at the manifold of Barge #2.

▼ M & M Drilling Company's new raised-deck Barge #2 can drill in water depths to 18 feet, instead of merely the usual 12 feet.



More in-stock items to avoid delays More specials to avoid makeshifts More research to prevent trouble

You get more of EVERYTHING when you insist on TUBE TURNS!

There was never a time when *known* value was so important, when *extra* care was so necessary in buying components for welded piping systems. It is a time when you must make sure TUBE-TURN quality goes into your job, not merely into your specifications.

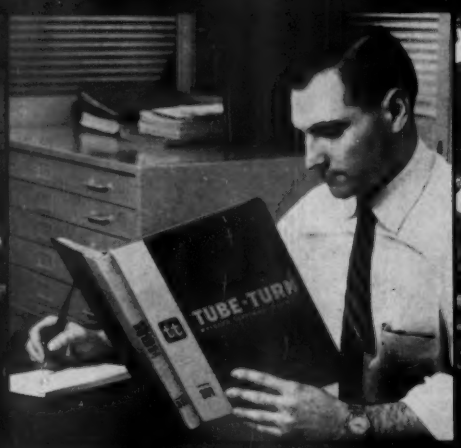
TUBE-TURN Distributors and responsible piping contractors are glad to give you this assurance. They are proud to provide affidavits on any job that they have met your specifications to the letter, affidavits in which they identify and describe whatever substitutes they supply within the "or equal" latitude allowed.

You get more of *everything* when you insist on TUBE-TURN welding fittings and flanges, the finest in product and service when you rely on the people who supply them regularly and are proud to prove it. Write for a copy of our new Bulletin 1031-H218. It's interesting and informative. TUBE TURNS, Louisville 1, Kentucky. "TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

TUBE TURNS

Division of CHEMETRON *Corporation*

More advanced engineering



More technical data to save mistakes

More responsible distributors

More service with less paperwork

More savings getting pipe installed

More dependability and satisfaction

LIFESAVER For The Men Who Design Piping

Tube Turns offers not only the most complete line of properly engineered welding fittings and flanges for utmost flexibility in planning any piping installation, but a wealth of technical data and able engineering assistance without counterpart anywhere in the world. Standardizing on TUBE-TURN piping components saves time and trouble.

LIFESAVER For The Men Who Buy Piping

The world's most complete line of welding fittings and flanges, over 12,000 regularly stocked TUBE-TURN items, permits every specification to be met without compromise or delay. A fully responsible Tube Turns Distributor is as near as your telephone to give prompt delivery of *all* your needs from *one* source on a *single* order. Saves time, paperwork, multiple checking, piecemeal deliveries and the inevitable problems of divided responsibility. You *save* money when you standardize on TUBE-TURN piping components!

LIFESAVER For The Men Who Install Piping

Time is money in the assembly of a welding piping system. TUBE-TURN welding fittings and flanges do not require remanufacture or compromises . . . or the delays that result from rejections. They are uniform, precision-engineered for easy, time-saving installation. And you can put them in and *forget* them because they *are* dependable. TUBE-TURN piping components cost less because they save more in every way!

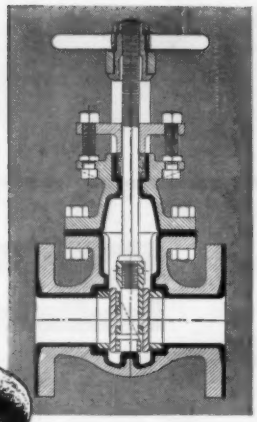
TUBE-TURN Welding Fittings And Flanges Are Stocked By And Sold Exclusively Through Authorized Distributors.

will your son be an oilman?

As he grows will the smudges on his face turn to oil from a rig encountering pressures and depths not dreamed of today? Will he progress from that rig to a panelled office somewhere high in the sky from which he directs a far flung empire of drilling and producing? Will his searches be costly or economical? Failures or completions? Much of your oilman son's success story will depend on new mud products evaluated and developed to meet the demands of new drilling environments. That's why today a portion of every dollar you spend with Milwhite is reinvested in research for tomorrow's decreased drilling costs.

MILWHITE MUD SALES COMPANY
HOUSTON, TEXAS
DIVISION OF MISSISSIPPI RIVER FUEL CORPORATION

MILWHITE



Darling rubber-lined (heavy lines) iron body gate valves with special alloy working parts provide trouble-free operation in many corrosive and abrasive services.

YOU CAN DEPEND ON

DARLING

Darling rubber-lined iron body gate valves eliminate the need for expensive special alloy valves in many different applications.

The hard rubber lining on bodies and bonnets provides high resistance to corrosion and abrasion in services up to 180° F. and working pressures up to 150 lbs. The revolving double disc parallel seat and wedge construction minimizes friction, avoids wear concentrations, and automatically compensates for any valve seat deflection. *You can depend on Darling* rubber-lined iron body gate valves for maximum efficiency at minimum cost.

Darling rubber-lined iron body gate valves in rising stem, cylinder or motor operated, and quick-opening types, as well as rubber-lined iron body check valves, are available in sizes from 2″ to 24″. Write, wire or phone for bulletins.

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 1, Pa.

Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario, Canada
Vannes Darling-France, 23 rue du Commandant Mouchotte, St. Mandé, France

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GATE • BUTTERFLY • CHECK • SPECIAL VALVES • FIRE HYDRANTS

LUFKIN'S { MARK II Unitorque

is Easy on the Rods!

REDUCES ROD LOAD UP TO 10%

IT'S THE POLISHED ROD MOTION THAT DOES IT!

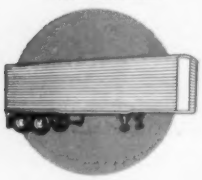
- **SLIM HOLES**
  Where small diameter tubing limits the size of sucker rods, the lower rod stress obtained with the MARK II allows the use of longer rod strings or larger pumps.
- **DEEP HOLES**
  Extends range of sucker rod pumping to depths previously unattainable.
- **BIG VOLUME WELLS**
  Lowered peak load conserves a greater portion of the polished rod capacity for handling additional fluid.

A NEW unit with the same OLD Lufkin Ruggedness and Dependability

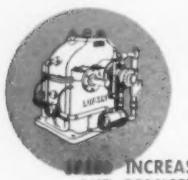
Due to the unique geometry of the MARK II, acceleration at the bottom reversal is decreased as much as 40%. This reduces peak loads up to 10% and tends to avoid shocks, resulting in longer rod life and lower servicing costs.

PUMPING UNITS

GAS ENGINES



TRAILERS



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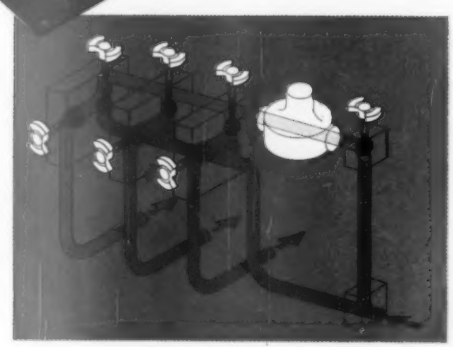
Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

oilmaster

HYDRAULIC PUMPING CONTROL MANIFOLD

"BUILDING BLOCKS" offer... Simplicity, Flexibility, Economy



Simplicity and Flexibility mean Economy with the new Oilmaster concept for Central Power Control Manifolds. Previously, hydraulic pumping systems required a maze of manifold plumbing to direct and control the rate of power oil flow to individual wells. Oilmaster has refined this plumbing maze to a simplified "building block" control system which is more efficient and easier to operate. This control system is built around well control stations, each having internal valves and ports for power oil distribution and control. One control station is included in the manifold for each well in the system. The manifold also includes the flow meter that allows selective metering of any well in the system. This "building block" design facilitates assembly and installation of Central Power Control Manifolds.

The block construction simplifies the control operation by permitting rapid switching to the meter header without interrupting the controlled flow of power oil to each well. Individual well control blocks are joined by flanged connecting spools which form continuous power oil passages to each block. Additional wells can be added to the manifold with minimum effort and cost... and the manifold or any component is salvable for moving to other installations.

For extra economy and flexibility the stainless steel valve seats are replaceable, and all valve parts are interchangeable with other elements of Oilmaster surface equipment. All valve stems have pressure actuated teflon packing to assure free turning. Large flow passages are provided for minimum pressure loss, and all connections are flanged with face type O-ring seals.

See your Oilmaster or distributor representative for further information or write Fluid Packed Pump, Armco Steel Corporation, 9100 S. Norwalk Blvd., Los Nietos, California for Bulletin 6103.

DISTRIBUTED BY: Beacon Supply Company • Dominion Oilfields Supply Company, Limited • Industrial Supply Company • National Supply Division, Armco Steel Corporation • Union Supply Company

ARMCO Fluid Packed Pump

A pilot operating a Sikorsky helicopter. It would have taken two weeks and a full crew to do the job that was done in just *one day*. Petroleum Helicopters, Inc., working at Stevens Point, Wisc., for Houston Contracting Co., placed 320 concrete pipeline ballast weights at 2,800 pounds apiece, in swamp, in 6¼ hours. The job was done using a Sikorsky helicopter and ¼ of a normal crew. And that's not all. While the cost to place each weight by conventional methods could be as much as $75, the Sikorsky helicopter cut it down to $15 each... saving up to $60 per weight.

When you have a Sikorsky helicopter working for you, you save in dollars, you save in time, and you get a pipeline ready for work long before it would be by conventional methods. Why not write today for all the details.

Sikorsky Aircraft

Division of UNITED AIRCRAFT CORPORATION, Stratford, Connecticut

You Get Welding Economy With Armco Line Pipe

Steel

For strength, economy, durability

It's a familiar sight in the oil country when welders join two lengths of Armco Line Pipe. Why? Because many pipeliners know the savings in time and money made possible with this popular pipe. For example, by selecting the *exact* diameter-wall thickness combination for your specific requirements, welding of *extra* thick pipe is eliminated. Armco's 132 different combinations make this selection possible. Armco Line Pipe is made in 10 standard wall thicknesses for each diameter.

Also, Armco's standard 50-foot lengths mean fewer field joints than with random and double-random length line pipe—you save welding and handling time.

Let us help you with *your* pipeline problems. Mail the coupon to **Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corporation, 6291 Curtis Street, Middletown, Ohio.**

Send me more information about Armco Pipe for the oil and gas industries.

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ARMCO Drainage & Metal Products

CONTINUOUS LEADERSHIP — CAMERON FLEX-SEAL VALVES

Introduced twenty-one years ago, Cameron Flex-Seal Valves outsell competitive valves year after year for the tough job of handling abrasive fluids at high pressures. For the control of drilling mud, for valve manifolds in well cementing and formation fracturing, operators choose Cameron Flex-Seal Valves for dependability and low maintenance cost.

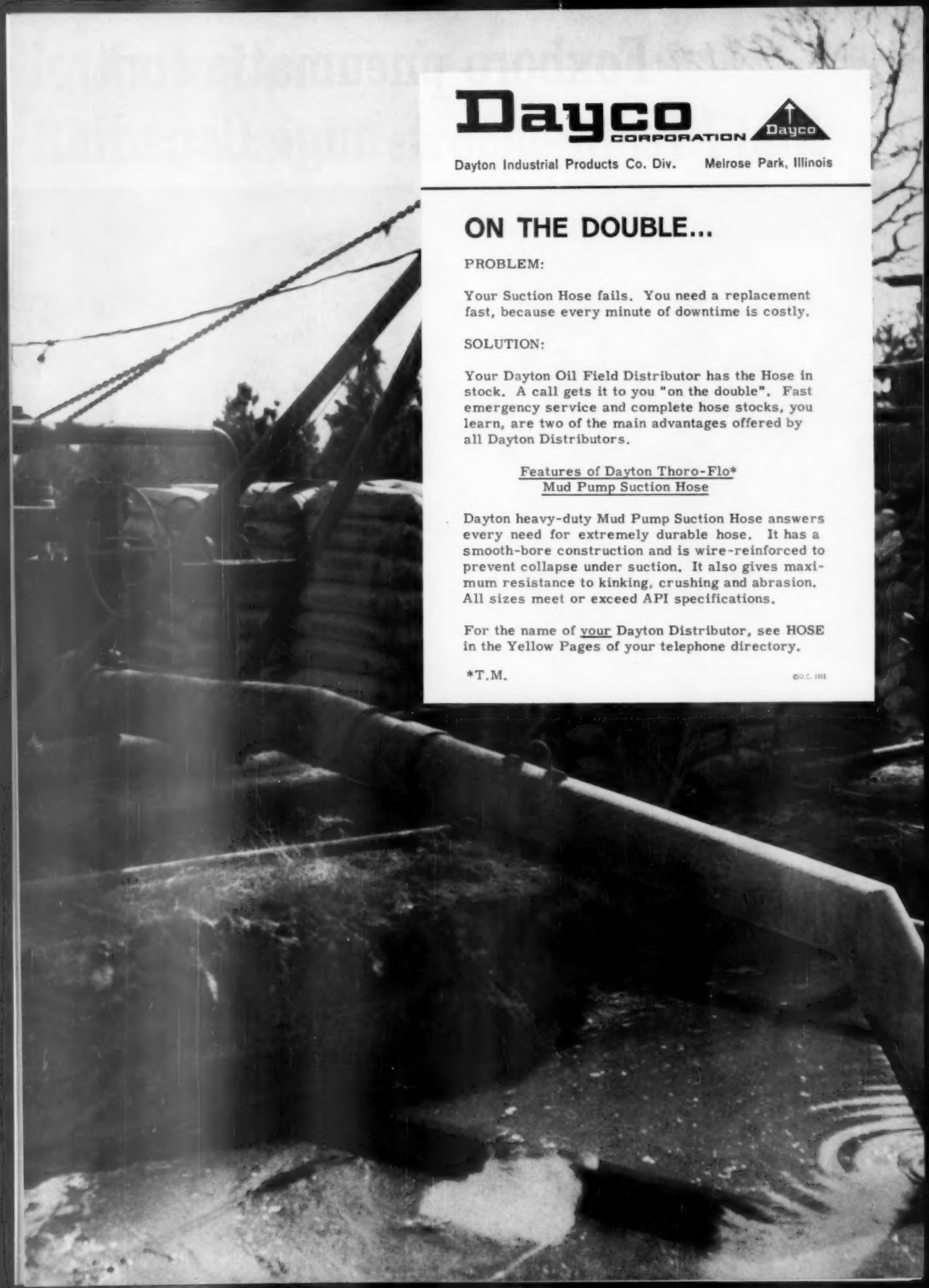
Examine the improved Cameron Type "R" Flex-Seal Valve and you will see why it is first choice of the field men. Any field man can replace worn parts without removing the valve from the line. A ball bearing reduces the torque for opening and closing. The resilient gate packing is tough and of generous size to insure tight shut-offs time after time, even after considerable wear. The position of the stem shows whether open or closed and in the closed position the amount of reserve packing rubber is indicated.

Choose Cameron Flex-Seal Valves to tame your abrasive liquids.

Cameron

CAMERON IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS

CAMERON FLEX-SEAL VALVES



Dayco CORPORATION

Dayton Industrial Products Co. Div. Melrose Park, Illinois

ON THE DOUBLE...

PROBLEM:

Your Suction Hose fails. You need a replacement fast, because every minute of downtime is costly.

SOLUTION:

Your Dayton Oil Field Distributor has the Hose in stock. A call gets it to you "on the double". Fast emergency service and complete hose stocks, you learn, are two of the main advantages offered by all Dayton Distributors.

Features of Dayton Thoro-Flo* Mud Pump Suction Hose

Dayton heavy-duty Mud Pump Suction Hose answers every need for extremely durable hose. It has a smooth-bore construction and is wire-reinforced to prevent collapse under suction. It also gives maximum resistance to kinking, crushing and abrasion. All sizes meet or exceed API specifications.

For the name of your Dayton Distributor, see HOSE in the Yellow Pages of your telephone directory.

*T.M.

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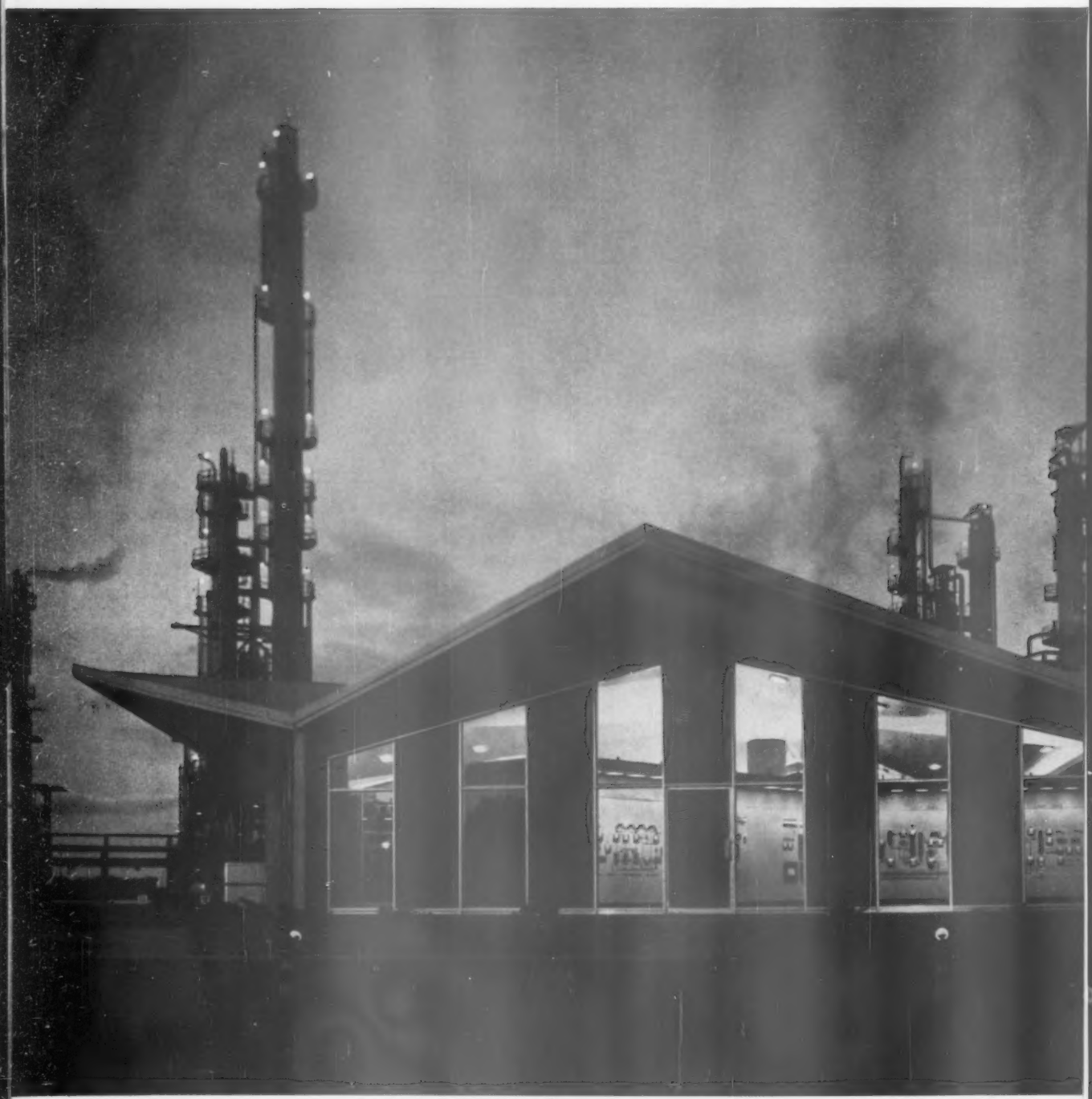
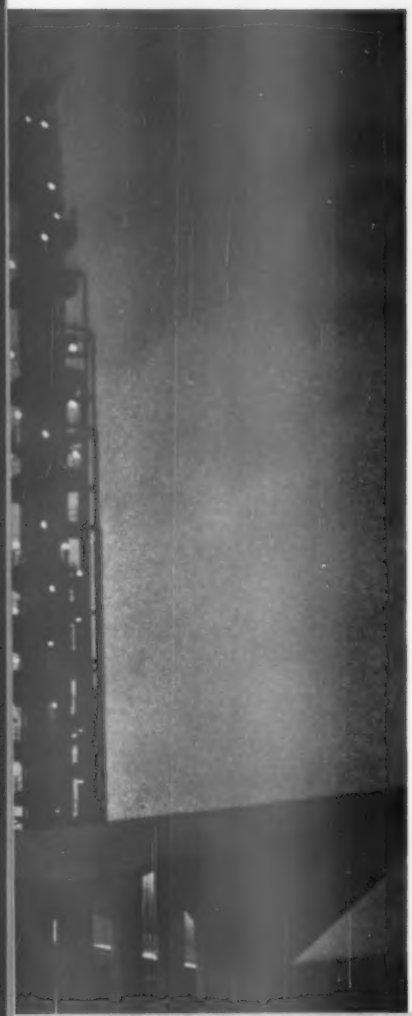
Foxboro pneumatic control huge Canadian



THREE FOXBORO CONTROL PANELS for Imperial's Chemical Products Cracking Unit are housed in this unique hexagonally-shaped control room. Panels, which are arranged in a star-shaped pattern, contain 178 Consotrol recorders and controllers. Panels were built by The Foxboro Company, Limited, Montreal.

installed at Refinery and Petrochemical Plant



Imperial Oil's giant Sarnia Plant counts on Foxboro Consotrol* instruments for accurate, dependable control

From its star-shaped control room to its towering columns, they've used the most advanced refining techniques at Imperial Oil's 94,000 barrel-per-day refinery at Sarnia, Ontario.

Little wonder that accurate, dependable, low-maintenance Foxboro Consotrol instruments were installed. For example, clay treating, cracking and fractionation, ethylene recovery, butadiene extraction, refrigeration, light ends, Hydrofining, Powerforming, debutanizing, detergent alkylation, and production of Naptha Specialties — all operate under Foxboro control.

Actually, you'll find Foxboro small-case pneumatic consotrols serving leading refineries wherever reliable instrument performance is a must. If you're not familiar with the Consotrol story, ask your nearby Foxboro Field Engineer for full details. Or write for Bulletin 13-18. The Foxboro Company, 608 Neponset Avenue, Foxboro, Massachusetts.

Reg. U. S. Pat. Off.

FOXBORO
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THESE FOXBORO CONSOTROL PANELS are installed in the Powerformer Unit Control Room.

BOWEN
BUMPER SUBS

IN CAVING, STICKY OR HEAVING FORMATIONS

A stuck drill string is expensive and time consuming

But Bowen has the answer to this problem — before it occurs.

A Bowen Drilling Bumper Sub, run above the drill collars, lets the operator work the pipe and free stuck drill collars or bits.

Run as an integral part of the drill string, the bumper sub allows immediate bumping action — **upward or downward** — to keep cuttings or cavings from wedging the string.

The Bowen Drilling Bumper Sub allows 15 to 20 inches of vertical movement of one part of the drill string in relation to another part — with striking surfaces at the limits of free movement.

Bowen Drilling Bumper Subs can also be used to great advantage in fishing operations.

An exclusive sealed oil bath provides constant lubrication of all moving parts and striking surfaces, to protect against wear.

BE READY!

Send for your copy of the complete technical manual on Bowen Drilling Bumper Subs today.

Available from your service company domestically; Sold through supply stores for export.

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BOWEN

"We need valves for rugged, continuous operation."

"We need valves that will reduce maintenance and replacement costs."

"We need valves for our severe high temperature-pressure applications."

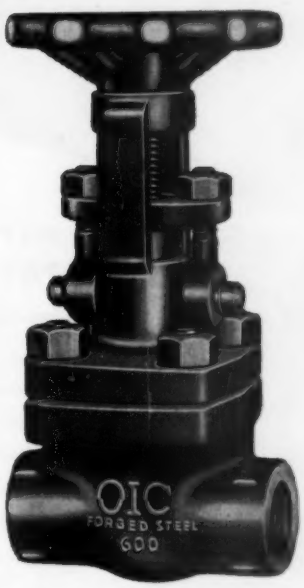
The answer to all 3 is OIC

FORGED STEEL VALVES

Key men . . . responsible for maintaining continuous production with minimum downtime . . . know the importance of valve performance!

That's why OIC, with years of experience in the chemical and petroleum industries, developed a complete line of forged steel valves for rugged service in high temperature-pressure applications.

Available for operation on all lines up to 2-inches, OIC forged steel valves are designed to meet your control requirements with minimum replacement and maintenance cost. Consult your local OIC distributor today. He can help you select the exact valve you need.



Available with trims to service most applications, and with socket weld, flange and screwed end connections.

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THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

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273 Main Street, Wadsworth, Ohio

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"A VIGOROUS USERS EXCHANGE ORGANIZATION"

"unmatched capability in its price class"

"WIDEST SELECTION OF INPUT-OUTPUT ACCESSORY UNITS"

"PROGRAMMING SUPPORT IN DEPTH"

"EASE OF USE!"

WITH THE BENDIX G-15 COMPUTER YOUR EXTRA DIVIDEND IS EXPERIENCE

There's a reason for the continuing leadership of the Bendix G-15 among small and medium-scale computers. The reason is *experience*... for over five years... in nearly 400 installations... in more than 1000 different applications.

Behind this experience is superior performance, real economy, and proven support... qualities which have made the G-15 preferred by thousands of engineers in industry after industry.

The G-15 achievement record is outstanding. It continues to be a leader in its field—the number of new G-15 users is growing every month. Investigate the proven capabilities of the G-15 today. See for yourself why G-15 "experience pays"... and how it can work for you. • *For information on your particular applications write to:*

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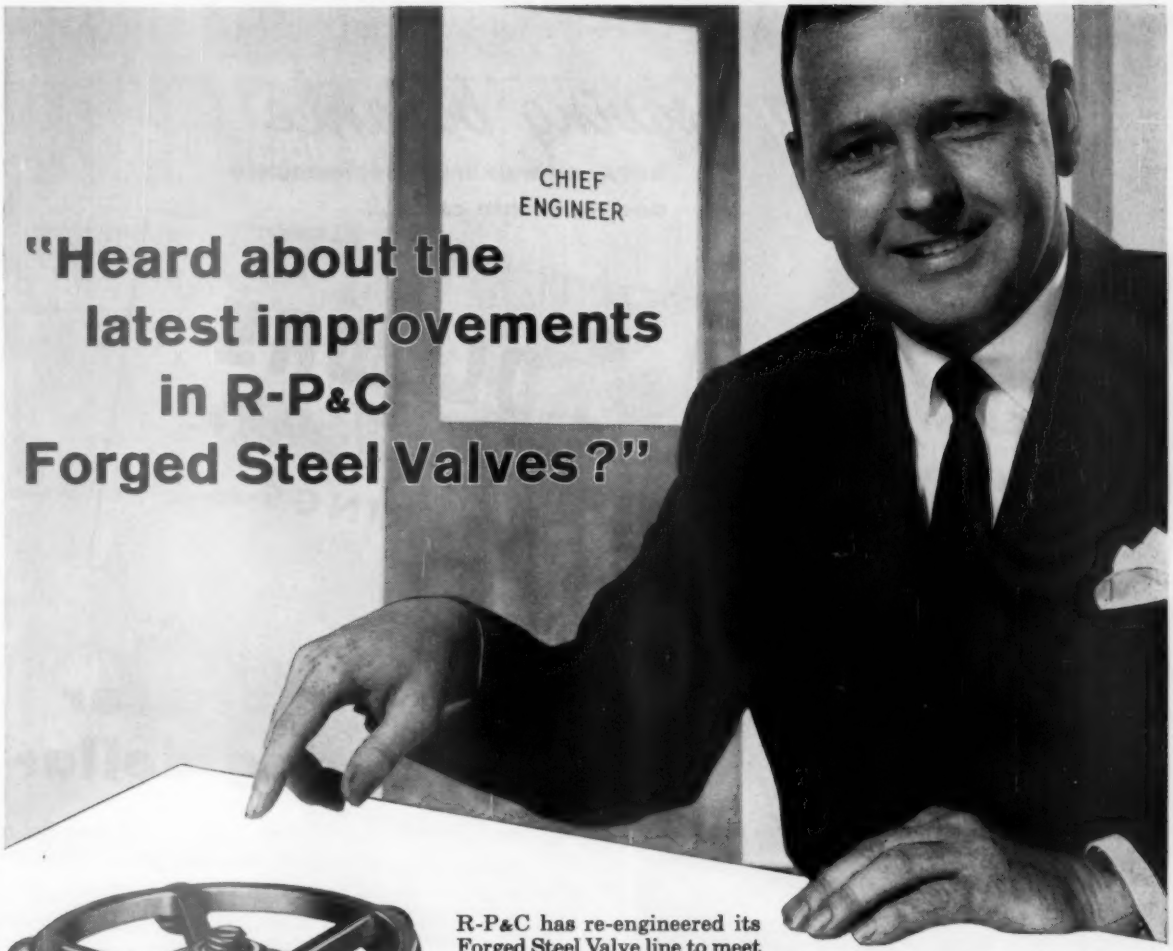


R-P&C has re-engineered its Forged Steel Valve line to meet the highest standards of quality for the Refinery, Chemical, Power and Process industries. These valves incorporate the most up-to-date design and material improvements found in any forged steel valve! One example is the stuffing box—redesigned for 50% greater sealing efficiency. These improvements add up to longer, trouble-free valve service for you, with minimum maintenance.

Here are other R-P&C Forged Steel Valve improvements:

- **Stellite-faced seats, lapped to 2-3 micro-inch finish; results in a durable seal**
- **Redesigned body bonnet joint gives 25% increase in gasket sealing area**
- **"390 Brinell" stem with rolled threads for continuously smooth movement**
- **Moly-Disulphide lubricated oil grooves in operating nut give easiest operation**
- **1200°F premium packing—uniformly compressed and graphited —includes a proved inhibitor that prevents corrosive damage**
- **Thrust washer between handwheel and operating nut eliminates seizing and galling**

In addition to Forged Steel Gate and/or Globe Valves, R-P&C distributors offer users in all industries a complete line of R-P&C gate, globe and angle valves in all standard materials: iron, bronze, bar stock, cast steel—plus many specialties.

See your R-P&C distributor for full details and prompt service.

R-P&C VALVES

ACCO

R-P&C Valve Division, American Chain & Cable Company, Inc.

Reading, Pa., Atlanta, Boston, Chicago (Melrose Park), Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For a money-saving balance

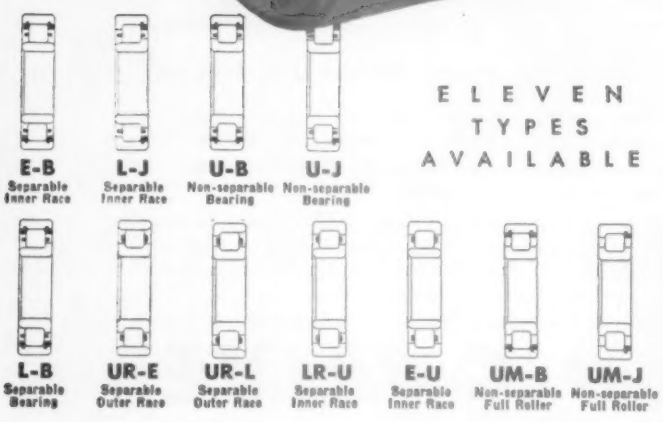
between maximum performance and moderate cost . . .

ROLLWAY Tru-Rol® BEARINGS

Give you more for your bearing dollar

For those hundreds of in-between applications where performance requirements are more exacting than those provided by the ordinary commercial bearing, but where maximum precision would be unneeded precision – specify Tru-Rol for the job.

Tru-Rol Bearings provide above-commercial-grade efficiency . . . at worthwhile savings in cost. Internal clearances are closely controlled. Rollers are equally spaced to eliminate out-of-balance vibration. Each roller is crowned to distribute the load evenly along the full length of the roller. Eleven types available in single and double width bearings, in stamped steel retainer, segmented retainer or full roller construction.



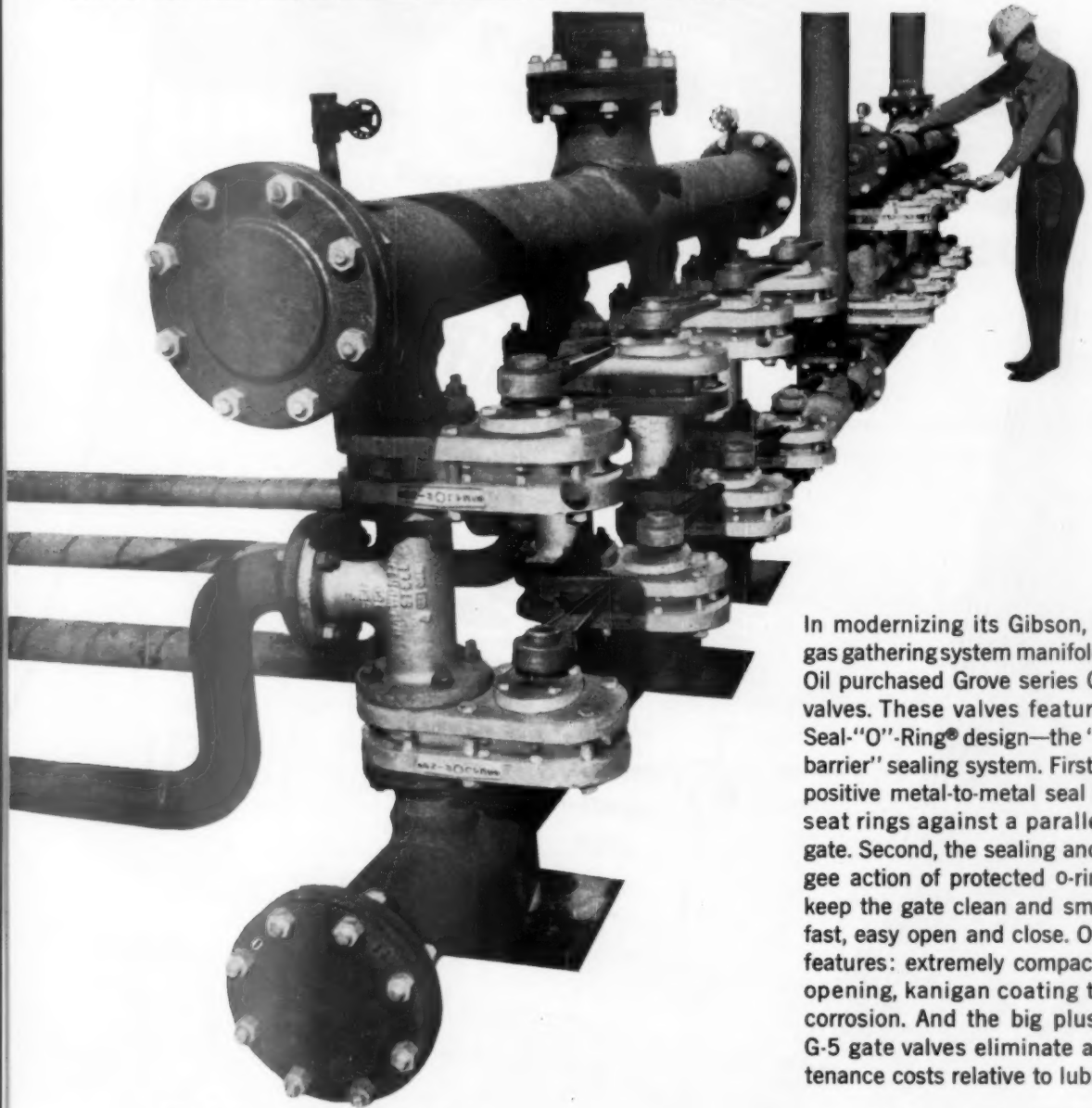
ELEVEN TYPES AVAILABLE

Ask your nearby Rollway Service Engineer to detail the quality you *should be getting* in your "commercial grade" bearings. Or write for the Rollway Tru-Rol catalog showing the full line, and capacity and size ranges. ROLLWAY BEARING COMPANY, INC., Syracuse, N. Y.

ROLLWAY® BEARINGS

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

40 GROVE G-5 GATE VALVES USED IN SHELL'S MANIFOLD MODERNIZATION



One of four Shell oil-gas gathering system manifolds at Gibson, La. Forty 3" Grove G-5 ASA series 150 Seal-"O"-Ring Gate Valves.

In modernizing its Gibson, La., oil-gas gathering system manifolds, Shell Oil purchased Grove series G-5 gate valves. These valves feature Grove Seal-"O"-Ring® design—the "double-barrier" sealing system. First, there's positive metal-to-metal seal of inner seat rings against a parallel sided gate. Second, the sealing and squeegee action of protected o-rings that keep the gate clean and smooth for fast, easy open and close. Other G-5 features: extremely compact, round opening, kanigan coating to resist corrosion. And the big plus: Grove G-5 gate valves eliminate all maintenance costs relative to lubrication!

Call or write for a complete Grove G-5 valve presentation

GROVE VALVES

GROVE VALVE AND REGULATOR COMPANY

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MADE IN THE U.S.A.
Costs no more than other premium wire ropes but gives you GUARANTEED satisfaction
keeps equipment in ACTION
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DOUBLE GRAY-X®...

the rope that's guaranteed to last longer

CF&I-Wickwire salesmen are visiting wire rope users from coast-to-coast, presenting the facts on Double Gray-X, the wire rope that's *guaranteed* to last longer. When he calls he will tell you about:

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CF&I-Wickwire's exclusive *guarantee* makes it possible for you to test our claims about the long life of Double Gray-X without risk. So *if you're interested in lower rope costs ...if you're looking for ways to lower your costly equipment downtime...* get the documented facts on Double Gray-X by sending in this coupon.

The Colorado Fuel and Iron Corporation
Wickwire Spencer Steel Division
Wire Rope General Sales Department
P. O. Box 232, Palmer, Mass.

☐ I'd like facts on CF&I-Wickwire's **guaranteed** wire rope . . . Double Gray-X

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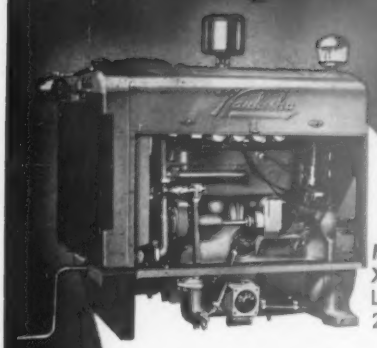


Model
XAHU
Long Life Unit,
21 **continuous** hp

over 30 years proven top performance by

in the world's oil fields

It's easy to pick a gas engine that's really "tailor made" to your needs. Get a Waukesha *designed-for-gas* engine! Then you can be sure—before you buy. The Waukesha gas engine line is *complete*. You can get exactly the right engine. The Waukesha combination of *designed-for-gas*—and built-for-gas construction features, and first quality materials—that means low fuel and lubrication costs—is the result of Waukesha's over fifty years' experience in building fine engines. Reliability is *built-in*. Most important of all—Waukesha Gas Engines have *proved* their reliability, economy and long life in all the oil fields of the world. In thousands of varied applications . . . for more than thirty years. That's why *Waukesha* is the word for *dependable* full rated horsepower on gas fuel. *Send for descriptive literature.*

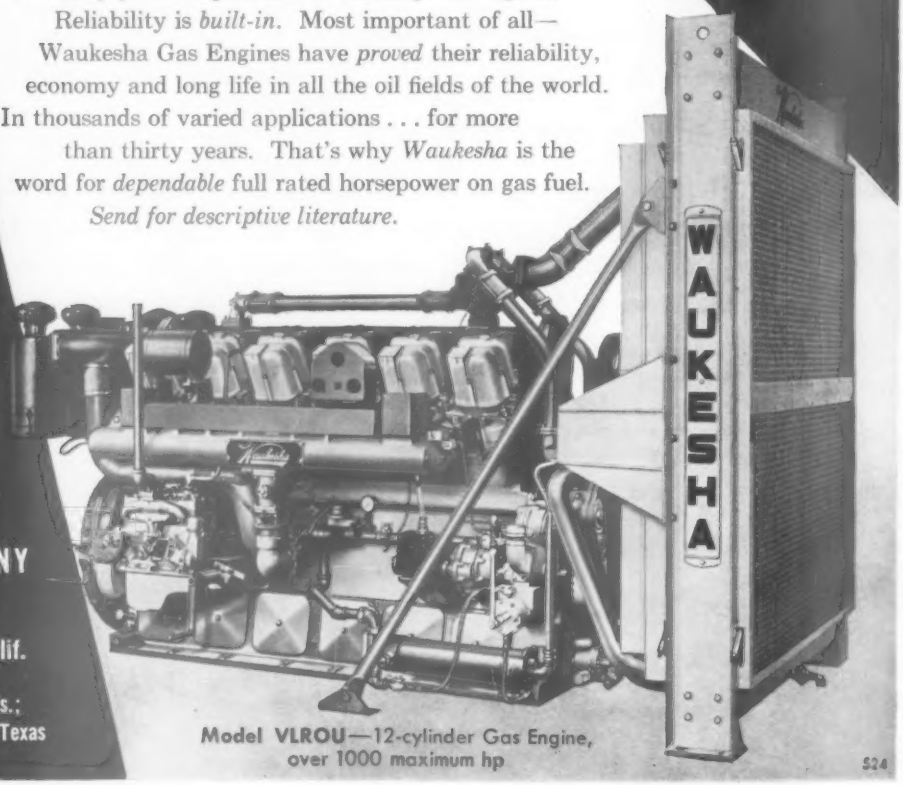
10 to 1027 hp

61 to 5788 cu. in. displacement

WAUKESHA MOTOR COMPANY

New York • Tulsa
Huntington Park, Calif.

Factories: Waukesha, Wis.; Clinton, Iowa; Houston, Texas



Model VLROU—12-cylinder Gas Engine, over 1000 maximum hp

S24

SPECIAL REPORT TO MANAGEMENT

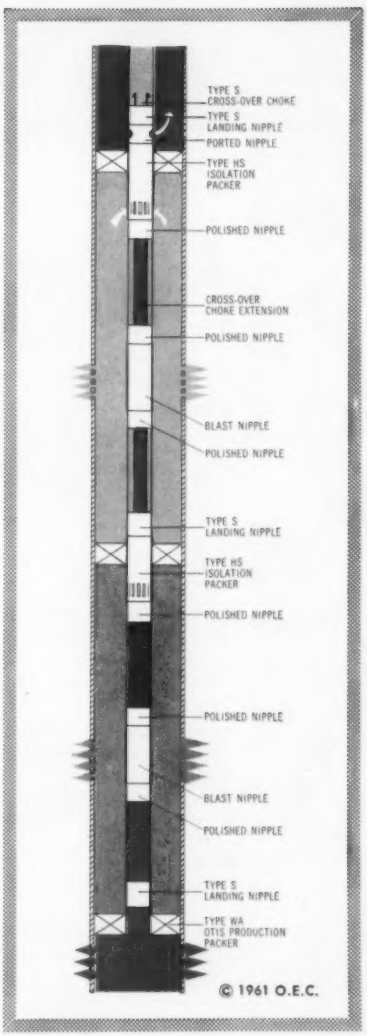
OTIS PRODUCTION NEWS

Volume II, Number 4 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

Otis Triple Zone Selective Cross-Over Completion Designed to Permit Production of Any Two Zones—Postpone Remedial Work

CORPUS CHRISTI—Operators in this area have found a new Otis Selective Cross-Over Completion ideal for producing new triple zone wells. The completion offers its greatest savings through selectivity of production, and is designed to postpone remedial operations which would entail moving a rig back over the hole. The completion is also designed to be made in standard 5½" casing using 2⅜" tubing to aid in holding downhole equipment costs to a minimum. This new Otis triple zone completion is designed to permit any one of the three zones to be produced individually with the other two blanked off, or two of the three zones to be produced simultaneously, directing the production from either zone through the annulus or the tubing as desired. When producing two of the zones simultaneously, one of the zones must be crossed-over just above the top packer through the use of a standard Otis Concentric Cross-Over Choke.

In addition to the above, this type of cross-over completion offers several other production advantages. The completion technique employed on initial installation is designed to permit each packer to be tested to the breakdown pressure of the zones before the next packer is set. Access to the upper zones is through the ports in the Sliding Side-Door® assembly of the Type HS Otis Retrievable Isolation Packer. Type HS Packers are used to isolate the upper two zones as shown in the accompanying installation diagram. In this installation, by straddling the upper zone with the top two packers, a short extension to the Otis Straight Flow or Cross-Over Choke acts to permit selective production of the middle and lower zones or the middle and upper zones through the tubing or annulus, with the alternate zone blanked off in each case. This also serves to permit chokes to be changed by standard wire line methods without requiring a rig over the hole.



In addition to these advantages, the completion technique is designed to permit any one of the zones to be exposed to the tubing or the casing, or both, with the other two zones blanked off for circulating, treating, and testing. Fracturing treatments on individual zones at pressures up to 4,500 p.s.i. have been performed in wells using this type of completion.

This is another Otis-engineered completion designed to provide the ultimate in economical, versatile, and efficient alternate-zone selective production. For more information on alternate-zone, selective and multiple completions, or for help with any other specific completion problem, call the Otis office nearest you or write Otis, Dept. 4-W, P.O. Box 35206, Dallas 35, Texas. You'll find your Otis Well Completion Specialists ready to help you . . . anxious to serve you.

OTIS

Engineering Corporation

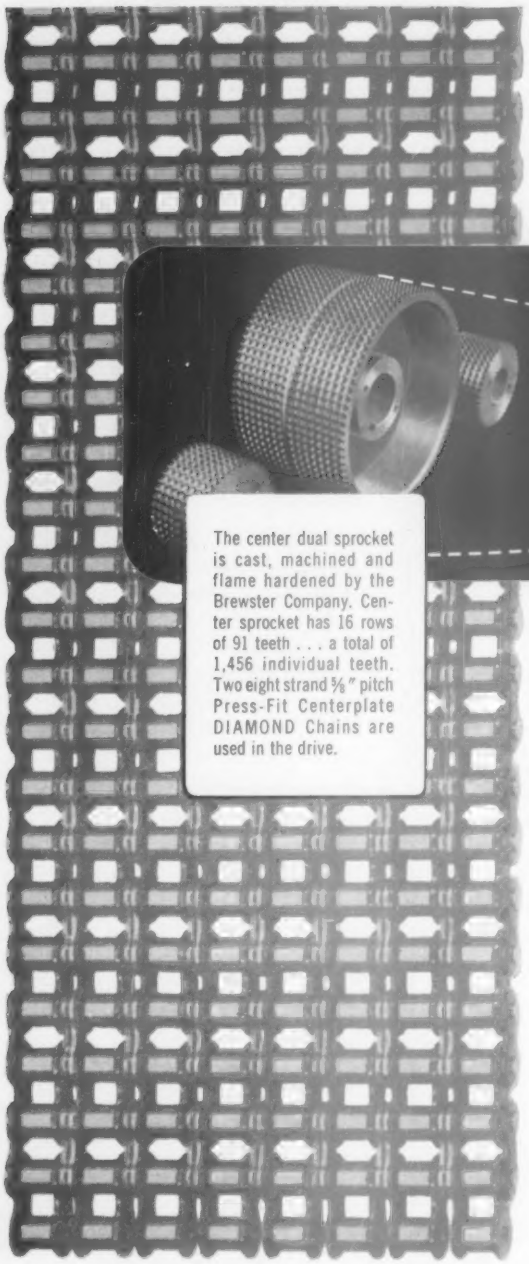
General Offices:

6612 Denton Drive • Dallas, Texas

DIAMOND PRESS-FIT

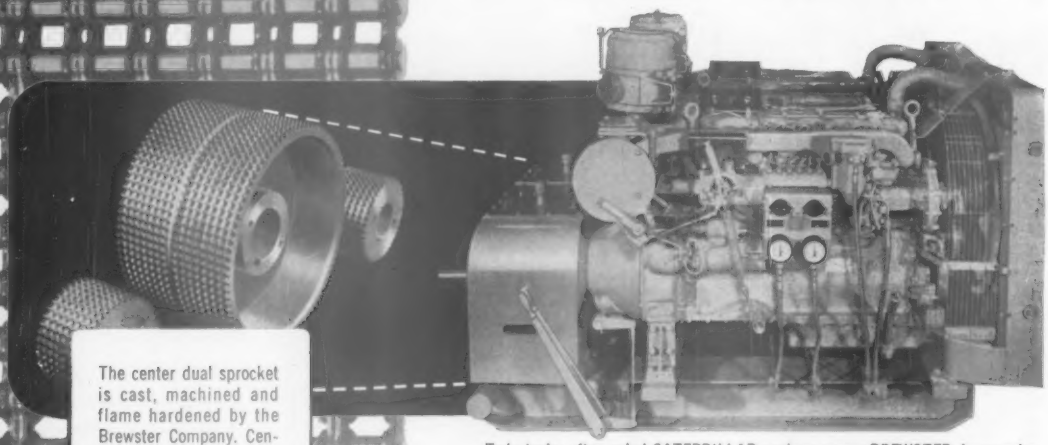
CENTERPLATE ROLLER CHAIN

(Diamond Patent No. 2,466,639)



The center dual sprocket is cast, machined and flame hardened by the Brewster Company. Center sprocket has 16 rows of 91 teeth . . . a total of 1,456 individual teeth. Two eight strand ⅝″ pitch Press-Fit Centerplate DIAMOND Chains are used in the drive.

links twin engines in BREWSTER DRAWWORKS



Twin turbo-aftercooled CATERPILLAR engines power BREWSTER drawworks

The Brewster Company, manufacturer of oilfield equipment, used DIAMOND *Multiple Strand* Press-Fit Roller Chain to connect two D-333 Caterpillar engines to one drive shaft in this unique Twin-Engine Compound. Each engine is set to deliver 187 HP at 2200 RPM to share the load on the BREWSTER drawworks.

1 **DIAMOND Press-Fit Centerplate construction eliminates wear at centerplate holes . . . distributes the load uniformly over all linkplates.**

2 **Uniform load distribution gives the chain higher fatigue strength and greater capacity . . . reduces replacement costs and equipment downtime.**

3 **DIAMOND Press-Fit roller chain can now be installed or replaced in the field. Connecting links with precision ground center-plate bushings (BCL Links) may be fitted with hand pressure and have virtually 95% of the shock load capacity of press-fit links.**

DIAMOND *Press-Fit* Centerplate Roller Chain, for all its proven advantages *costs no more than slip-fit chain.* It is available in multiple-strand, custom lengths from ¼″ to 2½″ pitch, for a complete range of oilfield applications.

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MOBIL RESEARCH ANNOUNCES THE DEVELOPMENT OF THE
FIRST MODERN CRITERION OF TOTAL GASOLINE PERFORMANCE

The Megatane System of Rating Gasoline

Based on a five-year study of gasoline performance characteristics, the MEGATANE Rating System overcomes the inadequacy of partial ratings (such as octane) and provides an all-inclusive rating of gasoline performance.

As every gasoline technologist knows, octane rating is an important factor in the evaluation of gasoline. He also knows that it is far from the total measure of gasoline quality.

Since the octane rating was introduced 34 years ago, brilliant advances have been made in petroleum technology. For example, the invention of platinum reforming provides a means of producing a higher-energy gasoline that satisfies today's high-powered motors. Metal deactivators were developed to prevent carburetor gum deposits that foul carburetors and stick chokes. Phosphorous additives were developed to neutralize harmful combustion deposits and to give longer spark plug life. Detergent additives were introduced to keep carburetors clean.

These and many other characteristics are important to the gasoline user today. Unquestionably, there is a great need for a broad standard of gasoline performance that recognizes all of these factors. It is this need that Mobil research has sought to answer.

Development of the MEGATANE Rating System

The MEGATANE Rating System evolved from analysis of the many desirable performance qualities of a gasoline. This was coupled with an intensive study of the primary benefits and secondary effects of providing these qualities. This was important because in many cases these secondary factors altered the primary benefits, sometimes with unfavorable side-effects.

After long consideration and discussion, a large group of performance qualities was isolated as representing the important properties of today's ideal gasoline.

Evaluation of all these qualities was a complex undertaking—for the goal was not only to evaluate the qualities of a gasoline, but to be able to predict the gasoline's performance.

The MEGATANE Rating System

Our MEGATANE Rating System accommodates all the important qualities in today's gasolines. The MEGATANE rating of any gasoline is the total number of **effective** qualities it possesses on the MEGATANE scale.

In order to be **effective**, the quality must not only provide the performance advantage for which it is intended, but it must be free of adverse side effects which would cause trouble. This condition indicates the need of quality controls which define the effectiveness of every quality feature on this overall basis.

For example, high volatility is desirable to provide good cold engine response for fast acceleration. However, if the volatility is too high, so that it "vapor locks" the engine, it is no longer effective and no credit for this feature is given in the MEGATANE Rating System.

Another example, an **effective** carburetor deicing additive must not only efficiently combat stalling that occurs under icing conditions, but it must also be free from any adverse characteristics such as emulsification or chemical reaction that could shorten fuel filter life or foul carburetor operation.

In all such cases, the MEGATANE Rating System does not credit the positive advantage unless it is actually provided and unless it is free from any harmful effects such as indicated above. Both of these conditions must be satisfied to consider a quality **effective** in the MEGATANE Rating System.

The Octane Measuring Stick

The widespread use of octane ratings as a measuring stick of gasoline quality has been valuable to the extent that it has rated an extremely important factor in gasoline performance during an era of rapidly increasing engine compression ratios. This trend, however, has now sharply decelerated. Now there is a real need for a broader and more meaningful rating—one that goes far beyond octane rating in scope.

We believe that the MEGATANE Rating System is an important step forward in the attainment of such a goal. It is the first system to take into account all the important performance factors that enter into today's complex modern gasolines.

A gasoline skilfully formulated to meet high MEGATANE standards will provide, in the opinion of Mobil engineers, dependable total performance in today's cars over the widest possible range of driving conditions.

Mobil Oil Company

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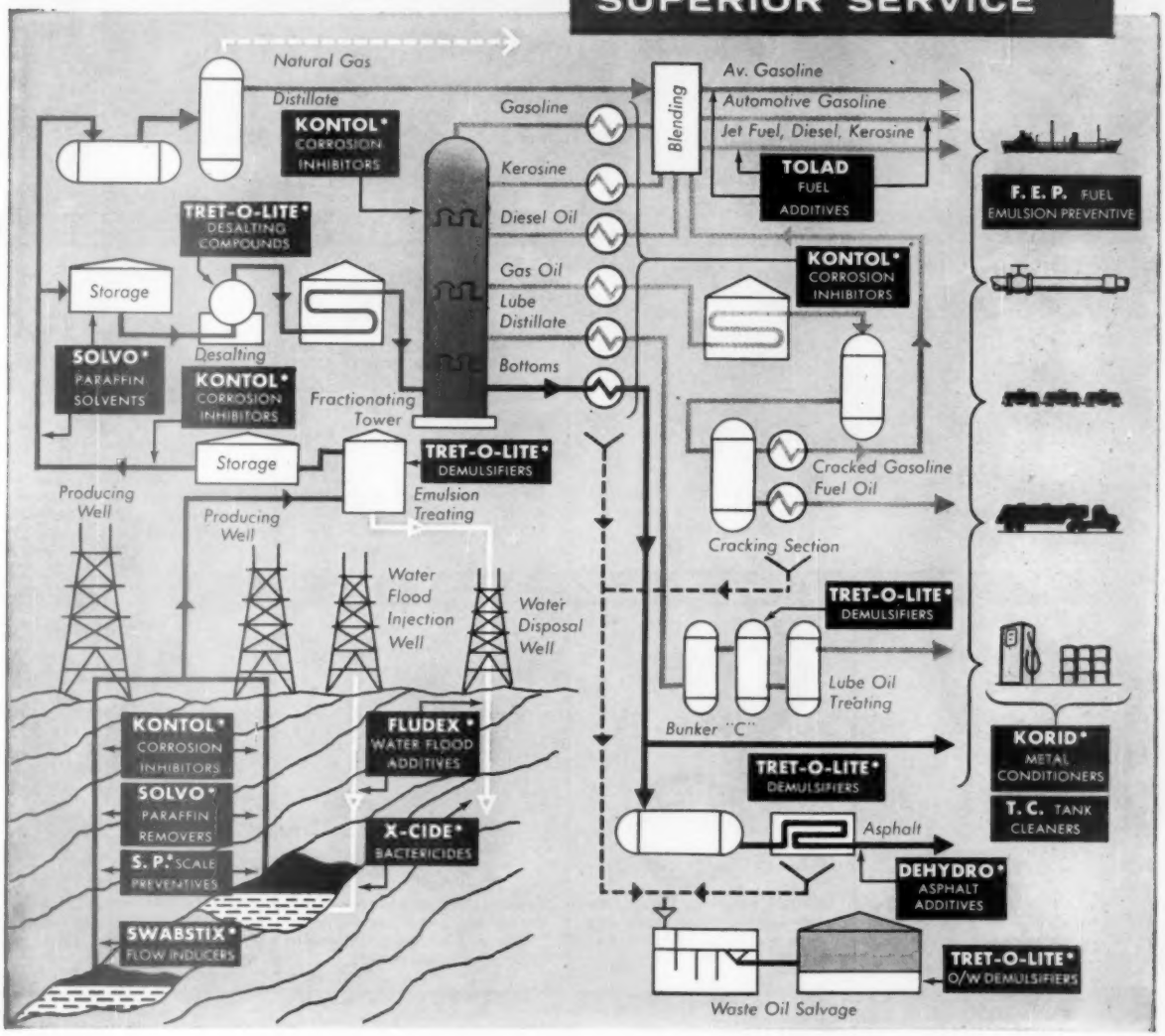

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AP-60-1

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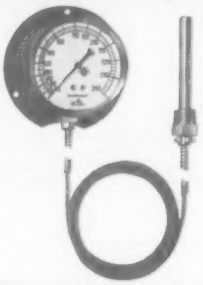
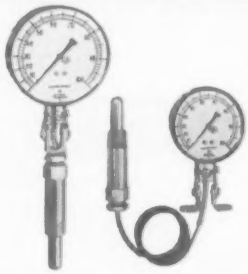


Distant reading thermometers—vapor-tension and gas filled types in many sizes; ranges.



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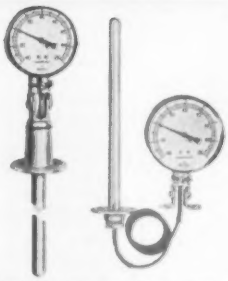

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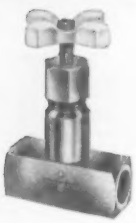

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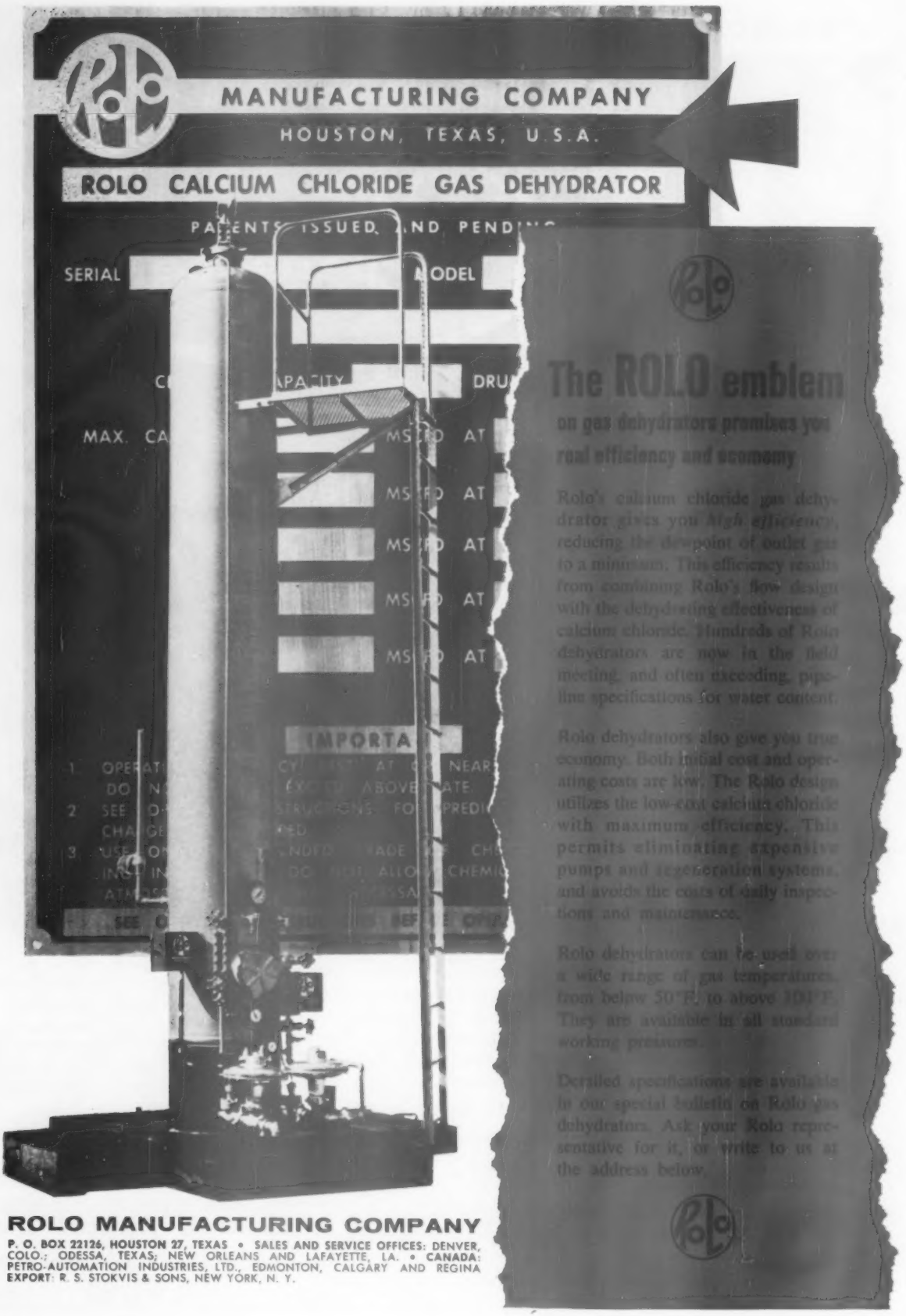
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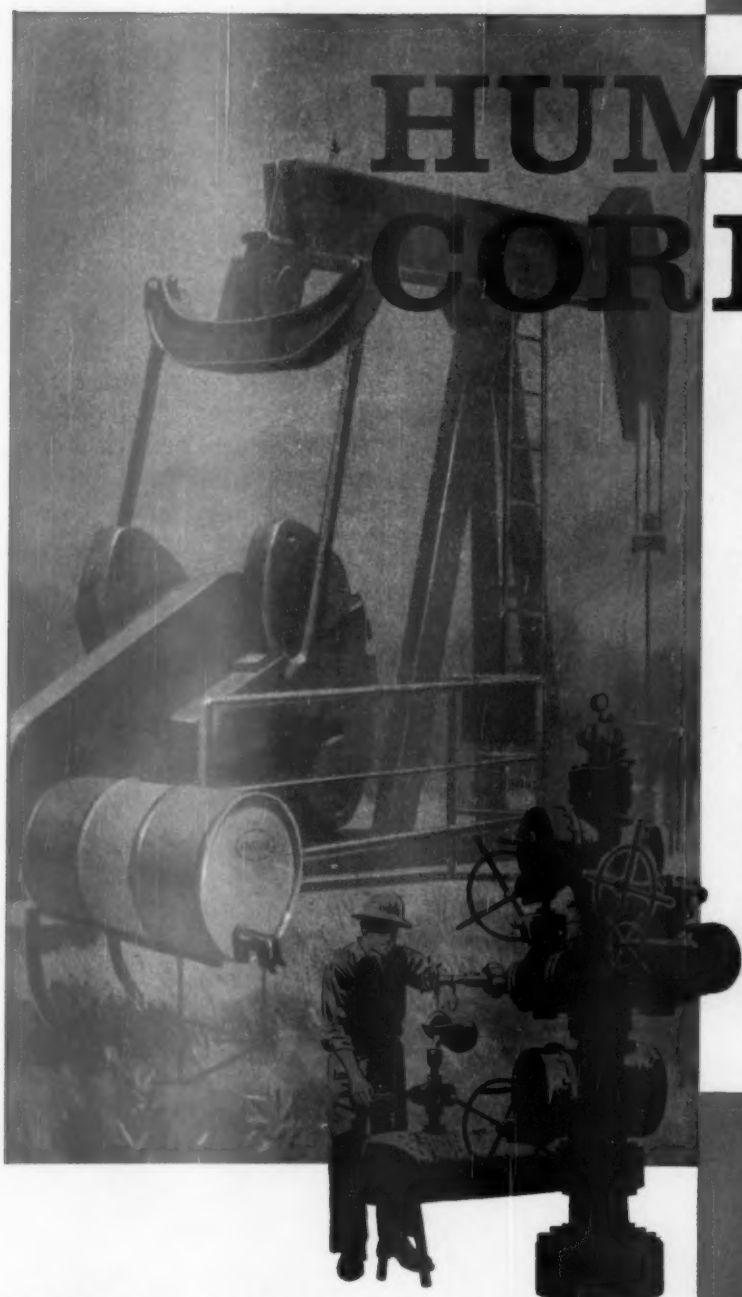

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● Furnishing the best possible plastic coatings to the oil industry is the number-one task at Plastic Applicators. Therefore a continuous high-priority research program is conducted in our own laboratories and in those of independent research organizations under contract to Plastic Applicators. ● Among the many advances that have come from this sustained research program was confirmation of the fact that conventional air-cleaning equipment does not completely remove airborne water and oil. Remaining water and oil can form emulsions that are harmful to plastic coatings. To eliminate this possibility, Plastic Applicators has installed air dehydrators at each of its plants to remove all water, oil, and other impurities from air used in applying Plasticap coatings.

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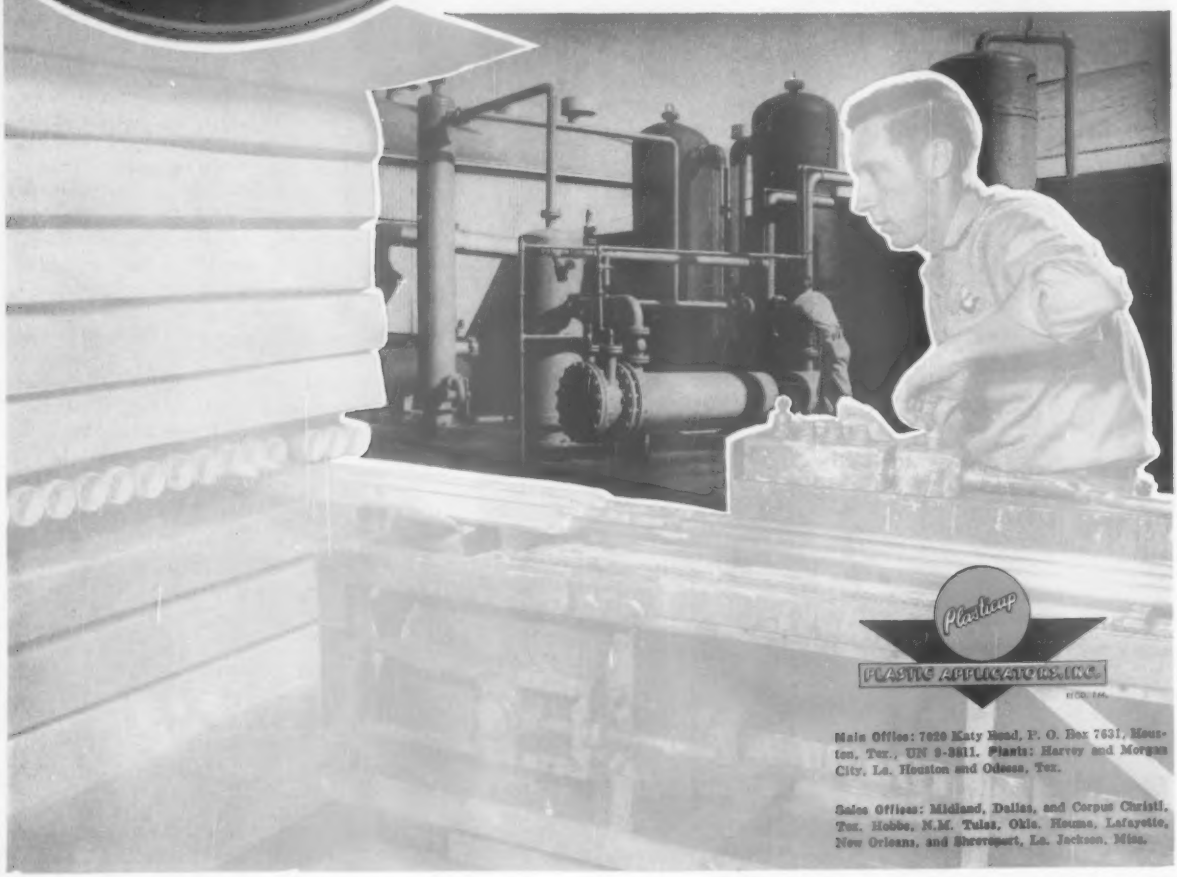

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They Say—

Legal service only

Dear Sir:

In your issue of July 17 you published an article entitled, "Libya May Set New Operating Pattern," (p. 41) in which my name was mentioned, a courtesy which is highly appreciated.

However, because of important professional reasons, and, being an independent legal and oil consultant, may I be permitted to clarify some of the statements made in that article concerning me personally.

My only connection with the new company is the normal connection between an attorney and his client. My firm of legal consultants offered only and strictly legal advice on matters brought to our attention and we prepared the articles of incorporation and by-laws of the new company.

I do not own a single share in the company and I am not on its board of directors. Apart from my good wishes to every client of mine, my only interest is to collect my fees for the legal service that my firm has rendered.

Furthermore, although it will be a privilege to be a partner with Libya's former premier, Mustafa Ben Halim, and former ambassador to Libya, Jack Tappen, yet I am not a partner with them in the consulting firm referred to in said article.

I shall appreciate publication of this clarification.

Anis Qasem
Tripoli, Libya

Not involved

Dear Sir:

In your issue of July 17 my name was mentioned in connection with the formation of the National Oil Co. of Libya. It was stated in this article that I was "being given credit for organizing the venture." I should like to state most emphatically that I had no part in any way in the formation or organizing of the said company.

You appreciate fully well that as a consultant and adviser to the Libyan Government on oil affairs,

it is improper for me to associate myself in any manner with such ventures.

I shall, therefore, be grateful if you print a correction in the next issue of your magazine.

Dr. Nadim Pachachi
Oil Consultant
Tripoli, Libya

It's no co-op

Dear Sir:

We observe in your article "Libya May Set New Operating Pattern," in the box score, "Who's Involved in New Libyan Company" and also under the paragraph "Ready-made markets . . .", that Texas City Refining, Inc. is referred to as a co-op, leaving the impression that it is organized and conducted on a co-op basis.

We would like to correct this impression since Texas City Refining, Inc., is not a cooperative, but is instead fully taxed on all income at the full 52 cent rate on every dollar.

Tom Dobbie, Manager
Personnel and Public Relations
Texas City Refining, Inc.
Texas City.

Amen, brother

Dear Sir:

A long distance, back row, AMEN to your article "Geologic Hiatus," by Ed Zink (OGJ, July 24, p. 116). Too often the contribution of well samples, with their unique information, is overlooked or neglected.

The AAPG has worked long and hard on this problem, but the Journal should reach those oil and gas hunters not cognizant of the wealth in dollars and information in a carefully caught, clean, complete set of well samples.

David T. Richards
Orlando, Fla.

And a pleasure to us, too

Dear Sir:

My slim hole article published in your July 17 issue ("Slim Holes Can Cut Hard-Rock Drilling Cost," p. 81) was certainly cleverly presented and apparently well received.

We wish to compliment you on your presentation. We have had a number of compliments by way of telephone calls and letters on this article.

It has been a pleasure to participate with you in this particular article.

Frank M. Pool, President
Pool Well Servicing Co.
San Angelo, Tex.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

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CALENDAR

AUGUST

11 Southern Gas Association, pipeline chief engineers' roundtable conference and gas measurement superintendents' roundtable, Dinkler-Tutwiler Hotel, Birmingham.

11 Southern Gas Association, accident prevention roundtable conference, Hotel Heidelburg, Jackson, Miss.

20-22 North Dakota Oil and Gas Association, ninth annual meeting, Plainsman Hotel, Williston, N. D.

20-24 Asphalt Institute, international conference on structural design of asphalt pavements, University of Michigan, Ann Arbor.

28-30 Appalachian Gas Measurement Short Course, West Virginia University Morgantown, W. Va.

28-Sept. 1 American Society of Mechanical Engineers, international heat transfer conference, Boulder, Colo.

SEPTEMBER

5-8 American Chemical Society, Chicago

Let's Be Clear:

Do all "power shift" transmissions give you the same high productivity?

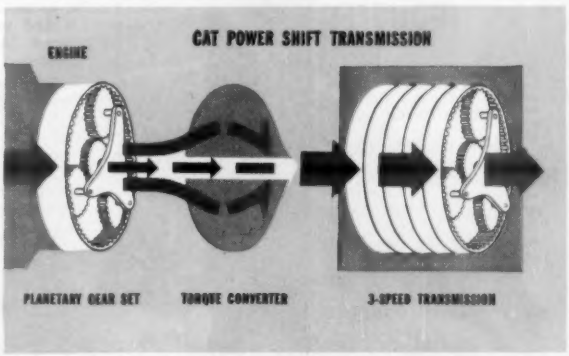
The power shift transmission has made the Cat D9G and D8 Tractors and 583 Pipelayer the most remarkable production tools ever introduced to pipeline contractors.

But let's be clear on this point: the success of the Cat power shift transmission does not mean that any so-called "power shift" is going to give you the same high productivity. The reason is that no other transmission but Caterpillar's combines these two vital features:

Single-lever control. And we mean single-lever. No if's, and's or but's. Cat power shift lets the operator shift into any of three speed ranges, forward or reverse, while moving—without braking or clutching—with just one lever.

Torque divider. With exclusive torque divider, Cat power shift transmission is a combination of direct and torque converter drive, with the advantages of both. There is the economy and quick response of direct drive plus the anti-stall and torque multiplication of a torque converter drive.

What does this mean on a pipeline spread? With Cat power shift tractors and pipelayers, gear changes can be made under full load without any loss of momentum. A pipelayer operator, busy with the draw works, can even shift gears up or down with his elbow! And he commands split-second response for leapfrogging, has high torque available for crawling up steep hills and handling heavy pipe. Easy and precise control lets the machine inch ahead or leap forward to a new position down the line . . . doing away with clutching and tiresome shifting keeps an operator sharp and efficient all day long.



Design Principle: Total engine power is delivered to the 3-speed transmission in two ways—part goes direct to the sun gear of the planetary torque divider; the remainder is delivered to the torque converter, then to the ring gear of the torque divider. Total engine output leaves the torque divider on the planet carrier and into the 3-speed transmission. This gives Cat power shift the advantages of both methods of drive. One lever controls it with fingertip ease. Unit construction makes it easy to service, but it's ruggedly built to stand up to the toughest jobs—over a ton of metal put together with the precision of a fine watch.

It's easy to see how this speed and ease of operation—coupled with the 385 HP of the D9G, or the 235 HP of the D8H and 583—can give you more production than your present machine in the same amount of time. And that's what owners have been getting.

No single machine improvement can match the Cat-built power shift transmission when it comes to giving you more work for your money on rugged pipeline jobs. And your Caterpillar Dealer is ready to prove it to you. See him soon.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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No-Wall-Stick Drill Collars Being eyed by the drilling industry

In the past year the No-Wall-Stick drill collar design has proved itself to be one of the few major improvements in drilling equipment since the introduction of the rock bit.

ENGINEERING ENTERPRISES, INCORPORATED

1200 San Jacinto Bldg.
Houston 2, Texas
CA 8-0386

No-Wall-Stick Drill Collars are available on a rental basis or may be purchased by the operator or drilling contractor.

Pat. Pend.

section, eleventh national chemical exposition, International Amphitheatre, Chicago.

7-8 Rocky Mountain Association of Geologists, field conference, Salida, Monarch, Ouray, Silverton, and Durango, Colo., areas.

7-9 Magic Plains Oil Exposition, Borger, Tex.

7-9 Alberta Society of Petroleum Geologists and Geological Association of Canada, convention and field trip, Canadian sedimentary basins, Calgary.

11-15 Instrument Society of America, fall instrument-automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference, Statler Hilton Hotel, Dallas.

13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

13-15 National Northern Development Conference, "Canada's New Role in Resource Development," MacDonald Hotel, Edmonton.

14 Natural Gasoline Association of America, Rocky Mountain regional meeting, Northern Hotel, Billings, Mont.

15-16 Kansas Geological Society, annual field conference, Mark Twain Hotel, Hannibal, Mo.

17-20 American Institute of Electrical Engineers, annual electrical conference of the petroleum industry, Jung Hotel, New Orleans.

18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

18-20 Standards Engineers Society, tenth annual meeting, Hotel Sherman, Chicago.

20-21 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, industrial electronics symposium, Bradford Hotel, Boston.

20-22 National Association of Corrosion Engineers, Permian Basin section, annual West Texas corrosion tour, Lincoln Hotel, Odessa, Tex.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical En-

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gineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

11-12 Western Petroleum Refiners Association, waste disposal and stream pollution conference, Hotel Lassen, Wichita.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.

15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual convention, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid-Continent regional meeting, Amarillo, Tex.

19-22 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

24-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-25 University of Kansas, Southwest Kansas Center, pipeline institute, Court House, Liberal, Kans.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 Western Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.

15-17 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.

28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.

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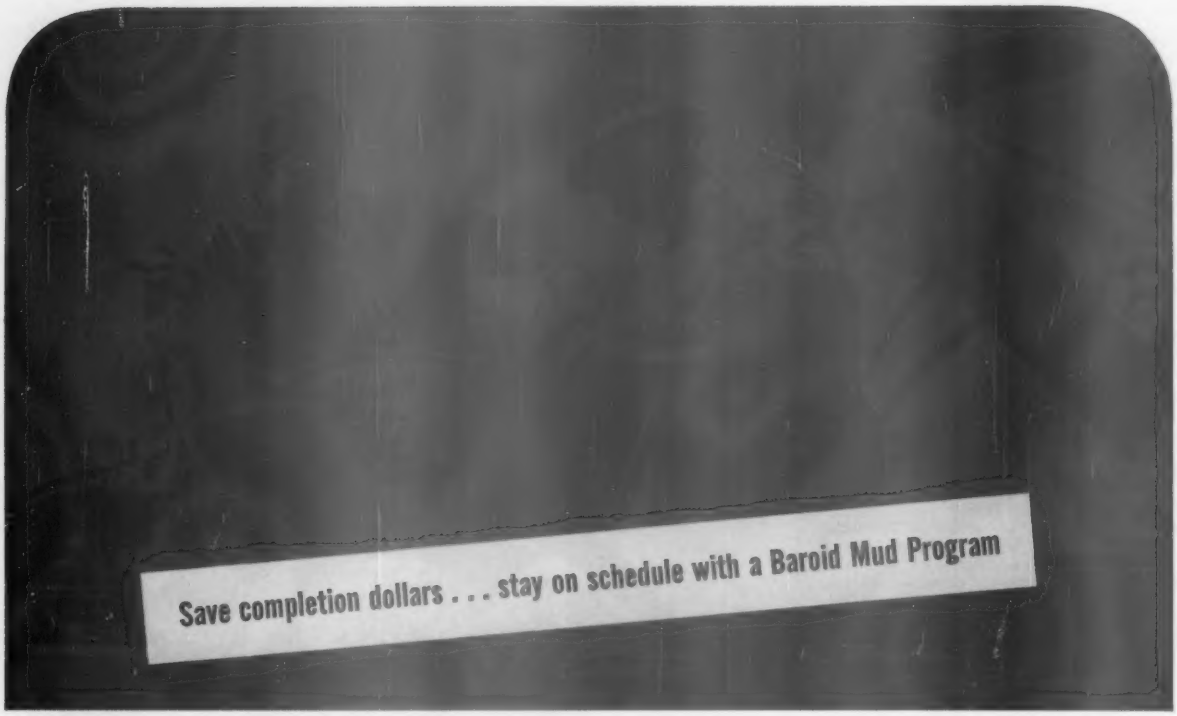

Baroid Field Report: Jim Hogg County, Texas

DURATONE* oil-mud solves completion problem

Recently a DURATONE-treated diesel oil fluid was used to successfully drill-in and open-hole complete a well in the shallow, water-sensitive Colorado sands in Jim Hogg County.

Previous wells were difficult to complete and were low volume producers. The completion difficulty and poor production were attributed to formation damage by the filtrate from conventional water-base mud.

The well, completed with DURATONE-treated diesel oil, was drilled to 2918 feet with an AQUAGEL**-water mud — 5½ inch casing set and cemented — cement drilled-out and the fluid in the casing displaced with diesel oil. Five lb/bbl of DURATONE was added through the hopper, as the diesel oil was circulated, followed by 10 volume percent water. API filtrate from this fluid was 10.1 ml of oil — no water. Twenty feet of hole was drilled with the DURATONE-oil fluid and the well completed. Cost of the DURATONE was only $1.80 per barrel. No other materials were added.

DURATONE is equally efficient in compounding completion oil fluids from either diesel oil or lease crude.

DURATONE, another product of Baroid research and engineering, saves you drilling and completion dollars and keeps your drilling and completion program on schedule. For more information on how the unique properties of DURATONE can benefit you, write for Product Data Sheet.

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6120

50 years ago

August 17, 1911

During July, according to reports from California, there was paid in dividends by the various oil companies operating in the state, the tidy sum of $700,000.

Directors of Standard Oil Co. at this week's meeting, declared the regular dividend of $6.00 per share. It is probable that this will be the last dividend of the company before the distribution of the stock of 33 of its subsidiary companies to its stockholders in accordance with the decree of the Supreme Court.

25 years ago

August 13, 1936

Although progress has been made in estimating the recoverable oil in practically all types of pools, the growing importance of knowing the extent of the nation's reserves calls for a higher degree of accuracy, particularly in a large area, such as a state. Summations of scattered pool estimates, each containing errors, along with guesses as to pools where no careful study has been made, yield unreliable total figures. More field data appear to be the primary need at present. The International Geologic Congress in Moscow next year is expected to bring out the inadequacy of estimates now available. Recognized methods of estimating oil reserves are to be discussed.

10 years ago

August 9, 1951

The news that the United States Navy is folding up its costly venture of oil hunting in northern Alaska will bring mixed reactions from the industry and the public. There is a natural disappointment that huge reserves were not discovered in the territory. The reaction of most oil men is "I told you so." There is a well-supported belief that governments cannot find oil.

What will undoubtedly be the final British attempt to reach a negotiated settlement of the oil issue with the present Iranian Government is due to take place this week in Teheran. The future of the Iranian oil industry hinges on the outcome of the meeting. If discussions fall through again, then the Iranians will be left with a billion-dollar property which they can't operate principally because of a lack of tankers to move the production.

If recommendations of the Redwater field petroleum-engineering committee are followed, a cooperative-type water-injection program will be installed in Canada's largest oil field. This will entail a program that in size, number of wells, and oil reserves will be second only to the successful water-injection program in East Texas field that dates back to 1938. Redwater is 30 miles northeast of Edmonton, Alta.

JOURNALLY SPEAKING

Wealth of India

OIL MEN never seem able to convince anybody that the industry isn't just one big bed of roses—that is, until the doubtful party decides to get in on the good thing.

One of the latest cases in point is India, which a few years ago decided henceforth to find, produce, refine, and market its own oil, and do without those high-living middlemen, the oil companies.

Now, India has found itself an oil field, and, after years of belaboring the supposed price shenanigans and sky-high profits of private firms, the country has suddenly discovered some thorns in that bed of roses.

The oil field is Cambay, north of Bombay, which for all practical purposes is making the Government's Oil and Natural Gas Commission an operating crude-producing company. And, as many another greenhorn outfit has learned, once you find oil your problems are just beginning. The money doesn't start rolling into the till; it starts flowing out.

Most of India's new-found problems and expenses will sound strangely familiar to oil executives who nightly take home briefcases packed with assorted headaches, aggravations, and miseries. Here is what the commission is finding:

Misery 1. High production costs. Only 3 of 20 or more Cambay wells drilled so far are flowing wells; the rest must be on pump. Pay is at 5,000 ft., and drilling won't be cheap. The crude has 17% paraffin, and the wells will undoubtedly plug up once in a while.

Misery 2. High transportation costs. Cambay crude is solid at room temperature, and heating elements will have to be installed in every tank truck used to haul it out.

Misery 3. Poor refining characteristics. The crude has little in the way of light ends and is considered unfit for refining. It is suitable only for use as fuel oil in special furnaces, possibly after being run through a simple topping plant.

These miseries are by no means insurmountable, of course, provided a market can be found for the crude, and it can be sold at a suitable price. Industries in the area could take nearly 20,000 bbl. daily by 1963, and the commission has decided a range of 100 to 110 rupees per ton of crude, or around $2.88 to $3.16 per barrel, will be about the right field price. But:

Misery 4. Competition. Private and government businesses in the area say they will be delighted to buy the commission's crude for a field price say, of 40 rupees per ton, or about $1.15 per barrel. This is less than half of what the commission believes it needs to get as a fair and reasonable posting.

The local industries, however, point out that domestically produced coal is delivered at their factory gates for about $6.50 per ton. They insist that despite a shortage of this coal the oil must be priced competitively. The industries also are insisting on a low price because they have offered to foot the transportation bill, and need to invest in the specially heated tank trucks.

Misery 5. Reserves. The Russians, who helped find Cambay, have told India the field has reserves of about 100 million tons, or around 700 million barrels. The Indians themselves are not so sure. In fact, after 3 years of drilling, the commission still does not have a clear idea of what it has. The start of commercial production has again been pushed back, and crude may not start running through a topping plant being built at the field until the spring of 1962. Meanwhile, drilling expenses mount.

Maybe the commission's pondering on these troubles will turn out to be a blessing in disguise, both for India and the oil industry. There is already talk in the country about the "gigantic" preparations needed to produce, transport, and market 20,000 bbl. daily. This new-found appreciation of how the oil industry actually works could lead to a better meeting of minds in government-industry negotiations. Let's hope this happens in India, and elsewhere, too.

—Ray G. Gibson

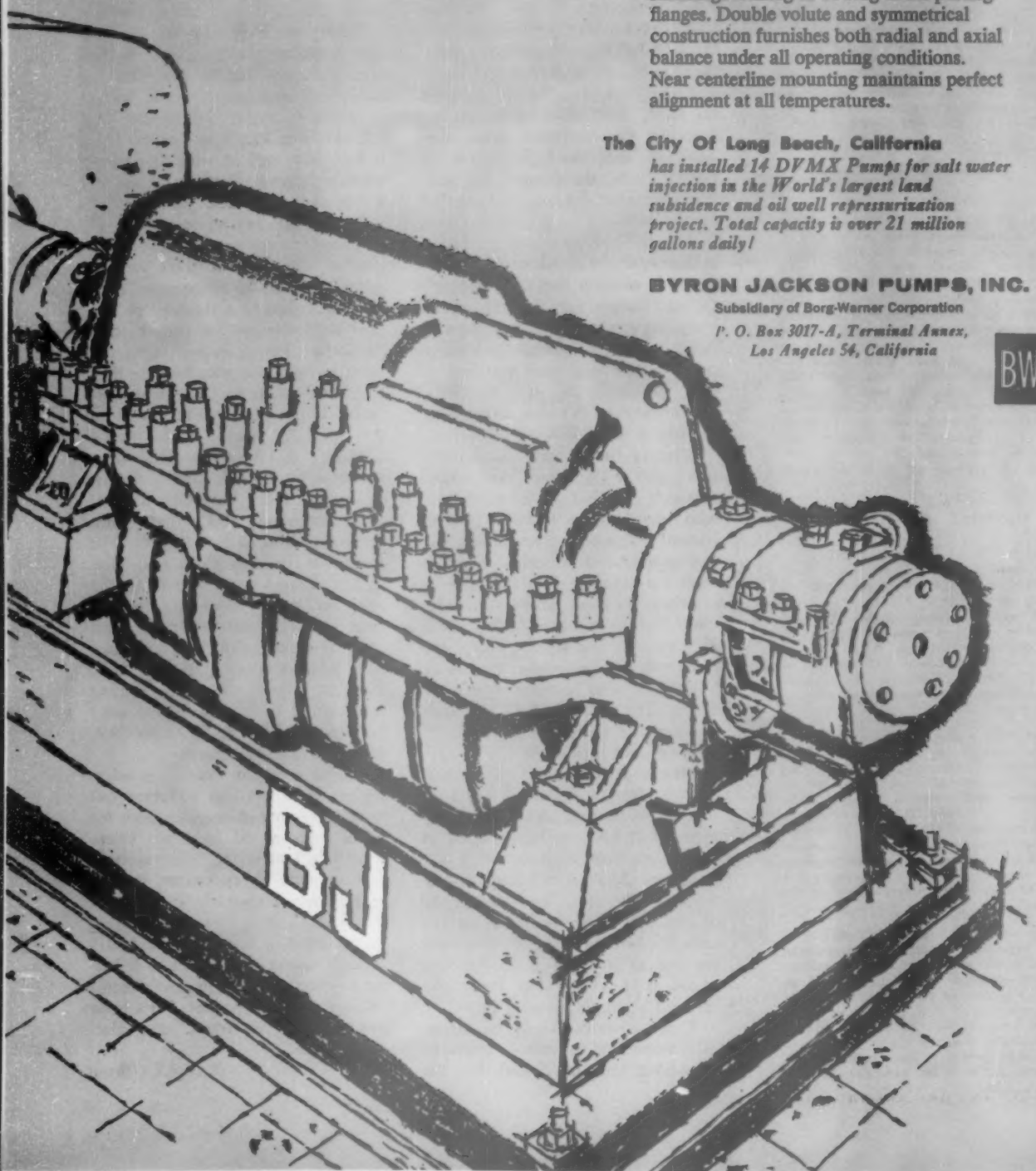
Quality *costs less* in the long run!

BJ High Pressure Pumps

For high pressure, high temperature and high speed pumping, an extra safety factor is built into this DVMX Pump—*the safety of a quality product!*

Clean and compact, BJ's advanced design allows double-row bolting to prevent interstage leaking or bowing at the parting flanges. Double volute and symmetrical construction furnishes both radial and axial balance under all operating conditions. Near centerline mounting maintains perfect alignment at all temperatures.

The City Of Long Beach, California *has installed 14 DVMX Pumps for salt water injection in the World's largest land subsidence and oil well repressurization project. Total capacity is over 21 million gallons daily!*



BYRON JACKSON PUMPS, INC.
Subsidiary of Borg-Warner Corporation
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BW

Damn the statistics —Full steam ahead

ONCE AGAIN, in the middle of the gasoline-selling season, the oil industry faces a crisis of excessive refinery runs, burdensome product stocks, and weak market prices.

It has but a few short weeks to get its house in order before the fall slackening in gasoline sales and the need to empty gasoline-storage space to make room for a buildup of heating-oil inventories.

What to do now should be obvious, but refiners as a group seldom use the obvious means for balancing supply with demand.

FOR THOSE WHO LACK or ignore other statistics, the Journal prepared a forecast of supply and demand for the coming months. It's on pages 142 and 143 of our July 31 issue. It was compiled from authoritative sources and was offered for industry guidance.

We forecast then that during the third quarter of this year total demand would be 9,363,000 bbl. per day, which is 690,000 bbl. per day below the demand during the first half.

Then we forecast that runs to stills would average 8,176,000 bbl. per day, which is 50,000 bbl. per day higher than during the first half. This, plus natural-gas liquids and imported refined products, would increase product stocks by 467,000 bbl. per day and bring them to 582,400,000 bbl. by the end of the quarter.

That was not a forecast of what ought to be done, but of what we thought refiners would likely do. It anticipated that stocks at the end of the quarter would be much too high, thus causing distress selling.

There are many individual views as to what level of stocks is "desirable." But in the Journal's opinion, primary stocks of refined products of 537,000,000 bbl. on September 30 would be fully adequate to meet all foreseeable requirements.

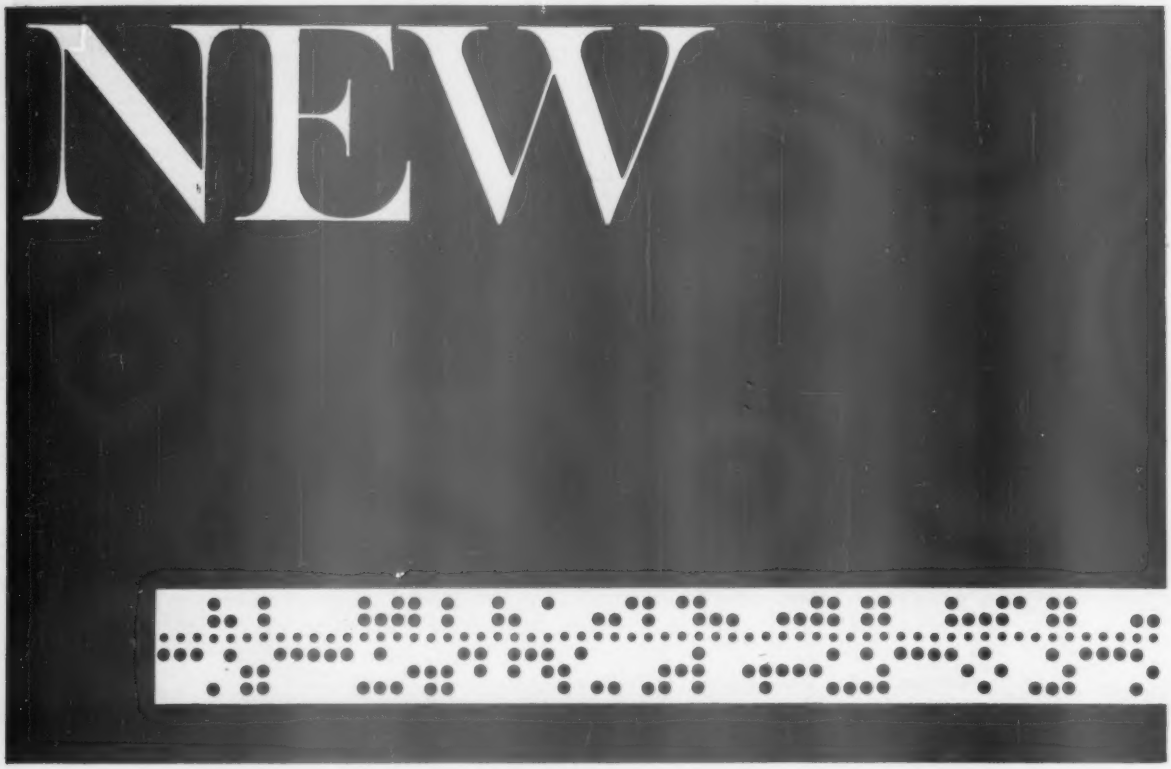
This is 45,000,000 bbl. below our forecast for the end of the quarter. To achieve it, runs would have to average 489,000 bbl. per day below our forecast. So instead of increasing stocks by 467,000 bbl. per day as we forecast they would, refiners should be cutting them by 22,000 bbl. per day.

To do this, runs should average 7,687,000 bbl. daily this quarter, instead of the 8,176,000 we forecast they would be.

Those who think our forecast too conservative may add 100,000 bbl. daily to demand, and still the need will be no more than 7,787,000 bbl. daily average runs for the entire quarter.

THIS QUARTER IS NOW half over, and so far runs have been well above even the 8,176,000 we forecast. Last week they hit 8,466,000, which is 780,000 above what we think they ought to be.

We can't tell an individual refiner how to run his business. But we can predict what will happen to markets if total refinery runs continue at the rates they have been so far this quarter.



Dowell provides electronic computer calculations to help operators select best frac treatments

Dowell's new electronic computing service is now providing rapid calculations – based on the Frac Guide* – to help operators select fracturing treatments best suited to their needs and available funds. This new service by Dowell costs you nothing extra, yet it offers operators new opportunities for greater profits from fracturing.

The computer provides calculations comparing the effects of different fracturing fluids, injection rates and propping agents for a given set of well conditions.

The computer output shows predicted production increase, treatment cost and payout for each treatment analyzed. These data can be plotted on graphs to give the operator a visual comparison of the treatments being considered.

The big advantage of Dowell's computing service lies in speed of calculations. Until now, it took an engineer something like a full day to calculate a single treatment with only a few variables. The computer requires less than ten minutes. This, coupled with Dowell's nation-wide teletype system, makes it possible to provide customers with many calculations quickly – usually in only a few hours.

Accuracy is another advantage. The computer minimizes the possibility of error in calculations and frees engineers to double check input data for accuracy and completeness. The result is more accurate, more reliable calculations than ever before.

Again, Dowell is helping operators improve fracturing results. Again, there is no extra cost. Ask for full information. Dowell services and products are offered in North and South America, Europe and North Africa. Dowell, Tulsa 1, Oklahoma.

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OVER-ALL view of the pilot project shows an open section of the tar-sand deposit in the center background.

Are the Tar Sands Now Competitive?

• Four-company combine reportedly has broken the technology barrier with a process to turn tar sand into crude economically. Now planned are a pipeline to Edmonton and a plant to produce 100,000 bbl. of crude daily.

THE secret which will unlock the world's greatest reserve of hydrocarbons—the 300 billion barrels in the Athabasca tar sands of Alberta—has apparently been found.

A 3,000-bbl.-daily pilot plant which has been operated by Cities Service Athabasca, Inc., Richfield Oil Corp., Imperial Oil, Ltd., and Royalite Oil Co. has proved successful, it was learned last week.

It was understood the next step will be construction of a commercial plant to produce 100,000 bbl. daily of crude oil from the sticky tar sands' bitumen and a 310-mile big-inch pipe line to Edmonton. There the oil would enter the Interprovincial and Trans-Mountain crude lines.

There was no formal announcement from the four-company combine. But pilot operations were said to indicate a cost which would make tar-sand oil competitive in all markets reached by Alberta petroleum. This would embrace Canada as far east as Toronto, and the northern U. S. from the Puget Sound of Washington to Buffalo, N. Y.

Cities Service, operator for the group, did confirm this much:

Technical breakthroughs necessary to commercial extraction of tar-sand oil have been made.

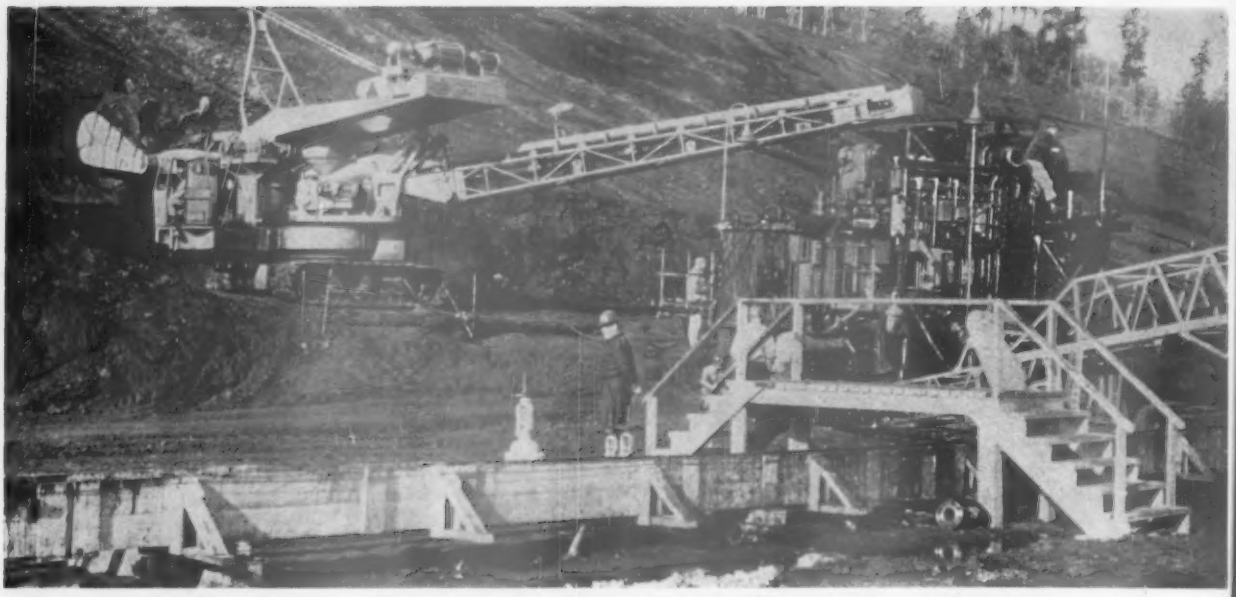
Plans for exploitation will be discussed before the end of 1961 with both provincial and federal governments, whose approval is required.

Tar-sand reserves . . . The vast tar-sand reserves, estimated to be equal to all of the world's known reserves of petroleum, are contained in a 30,000-sq.-mile area along the Athabasca River of northern Alberta.

The tar sands consist of an unconsolidated sand containing a heavy bitumen in varying concentrations on or near the earth's surface. In some locations the mixture is almost pure bitumen, but the average is about 10% bitumen content.

The Research Council of Alberta, which has studied tar-sands extractions for years, has said that only 5 billion barrels are economically accessible by open-pit mining methods.

Cities Service and its partners place the figure at 40 billion barrels, which corresponds to the petroleum



MINING equipment at left digs out the oil sand. Unit on the right extracts the hydrocarbons.

reserves of North America. In the Mildred Lake area, 310 miles north of Edmonton, where the group has its 186,000-acre lease, the tar sands are 150 to 200 ft. thick and 25 to 100 ft. below the surface.

Tar sand research . . . Known for almost 200 years, and a lure for oil men for the past 50, the tar sands have heretofore defied research efforts aimed at commercial separation of the oil from the sand.

Two small pilot plants were built by the Alberta Research Council near Edmonton in the 1920's. Another plant, this one testing a hot-water flotation process, was built at Bitumount in 1944.

In 1953, Royalite and Can-Amera Oil Sands Development, Ltd., bought the Bitumount plant and tested a centrifugal-separation process. Early results looked so encouraging that 4 years later Royalite announced a plant and pipeline costing $50 million. But this project never came to fruition.

Also in 1957 Sonic Oil Co. disclosed plans to bombard the sands with high-frequency sound waves and knock the oil loose in that manner.

At this same time Cities Service and Royalite were working in the Mildred Lake area. Cities Service was conducting laboratory and bench-scale studies of extraction methods, and Royalite took numerous core samples from the lease.

A large-scale pilot plant was placed in operation mining, extracting, and processing the tar-sands oil at Mildred Lake in August of 1959. In October 1959, Imperial joined Cities Service and Royalite. In December 1959, Richfield, which had proposed to separate the oil by a subterranean atomic blast, was added to the group to complete its present makeup. Royalite has a 10% interest and the others 30% each.

Pan American Petroleum Corp. a year ago proposed a test program of air injection and underground combustion. Shell Oil Co. of Canada has proposed injecting steam into test wells. These programs have not been cleared by the Alberta Oil and Gas Conservation Board.

Successful method . . . The present success stems from the Mildred Lake pilot operation begun 2 years ago under Cities Service supervision.

The pilot facilities, involving almost 100 workmen at the site, include a novel German mining wheel, a mobile extraction unit, and a combination visbreaker and distillation plant for refining the bitumen (OGJ, Jan. 18, 1960, p. 44).

After rocks and other foreign matter are separated from the oil sand, a light hydrocarbon derived from the oil sand is added to reduce the viscosity and specific gravity of the bitumen. Hot water strips out the sand, and the water is removed at a separation point, leaving a mixture of 67% diluent and 33% bitumen refinery charge.

After the diluent is flashed off, the heavy oil is charged to the visbreaker, which produces crude oil to be sold and the diluent makeup.

Since the 9° to 10° API gravity crude is 5% sulfur, it would probably be treated before being transported to market. The operators have various options as to how the oil will be handled.

To move the heavy crude by pipeline, it would have to be heated or diluted with a light hydrocarbon. In the latter case, a second line would be required to return the diluent.

Therefore, it is expected that the material will be upgraded by hydrogenation to a medium or high-gravity crude. Or it may be processed to yield mainly coke and gasoline. Transportation and marketing requirements would seem to favor upgrading to a pumpable crude comparable to the majority of Alberta crudes with which tar sands oil would compete.

If these decisions have been made, the companies involved are not yet ready to disclose them.

The hurdles . . . Having apparently surmounted technical obstacles, the companies still have regulatory hurdles to clear before the oil can be marketed.

The Alberta Oil and Gas Con-

VISBREAKER produces crude and diluent.

servation Board, which issued the research permit for the pilot operations, must authorize the refinery and pipeline. The National Energy Board will be interested in the project to the extent that it affects exports to the U. S. The jurisdiction of the board over exports, now applied to natural gas and power, could be extended to oil at the discretion of the government.

The rules that will govern production from the tar sands have not yet been written. But present proration and common purchasing regulations covering petroleum would not be suitable to the tar sands.

Before any investment of the order necessary to develop the tar sands could be made, the backers would probably require some assurance from Canadian authorities that they could produce the oil. This is presumably one of the matters that will be discussed within a few months.

What market? . . . In weighing the desirability of the project, the government agencies will consider the impact of a 100,000-bbl.-daily addition to Canada's oil supply at a time when the industry is producing at less than half of capacity.

This addition would be greater than a full year's increase in domestic and export demand for Canadian crude at the present rate of growth.

The new supply would either displace Canadian oil in present markets or be a net addition to exports to the United States. Either solution will not be easy.

The 1960 export level was 115,000 bbl. daily, and the 1961 average is expected to be around 165,000 bbl. daily. By 1963 exports are expected to reach 230,000 bbl. daily.

These levels are considered to be approaching the upper limits which would be permitted by U. S. imports officials. A further sizable increase would probably provoke a review of Canada's exemption from imports controls or crude shipped overland to the U. S.

So, if the Athabasca plant were to come on stream within 3 years—considered unlikely at this point—Canadian crude would probably have to move over to make room for these supplies in present markets. If the timetable were pushed back to 5 to 10 years hence, which seems likely, export to the U. S. in large volumes would be more acceptable.

The group has a big stake in marketing the oil. In a 100,000-bbl.-plant, Cities Service, Richfield (owned one-third each by Cities Service and Sinclair Oil Corp), and Imperial would have a 30.000-bbl.-daily share. Royalite would have 10,000 bbl. daily.

The two most logical export markets, in view of the project ownership, appear to be the Puget Sound area of Washington and Chicago.

Richfield has a Puget Sound refinery site. It is understood to have tentative plans for a 35,000-bbl. plant which could take the company's share of Athabasca output.

Cities Service has refineries at Toronto and East Chicago. Sinclair also has a refinery in the Chicago area, which is expected to open up to Canadian crude within the next 5 to 8 years.

Athabasca's future . . . The first project will be only the beginning.

Other permit holders also will be rushing to exploit the 30,000 sq. miles of tar sands when they too solve the materials-handling and tar-sand-separation problems. If it turns out that they can be developed economically—and the four-partner group appears no longer to have the slightest doubt—then this project would open a new era in energy-resource development.

The center of gravity of world hydrocarbon reserves, which has shifted since World War II to the Middle East, could return once more to North America.

It would also mark the beginning of reliance on petroleum substitutes in sizable quantities to supplement present oil supplies.

The fact that the tar sands can be economically exploited, and will be developed jointly by two Canadian and two U. S. companies, should be of great significance to North American security.

Court Fight Starts on Rig-Height Curb

THE oil industry is preparing a court fight to block new Federal Aviation Agency rules requiring a drilling contractor to obtain a permit 30 days before erecting a rig standing 150 ft. or higher.

Plans call for joint action by the American Petroleum Institute and the American Association of Oil Well Drilling Contractors. Their lawyers drew up a petition last week seeking a temporary restraining order from the Fifth Circuit Court of Appeals in New Orleans barring FAA from enforcing the order.

The action was planned as a protective measure in case FAA should decide against granting drillers relief following a conference in Washington earlier in the week. The legal time limit allowed the industry to seek legal redress against the order expired over the weekend.

Oil representatives at the Washington conference explained to FAA officials the problems the rule raises for the oil industry.

They emphasized in particular the added workload involved in the required filings, the difficulty in many instances of being able to give exact drilling locations 30 days before a rig is moved in, and the confidential nature of wildcat locations.

Although no specific promises were given the group by the FAA, agency officials said the meeting had helped them to understand the situation better. They said they would have to give the matter further study before reaching a decision.

Another Government Cook Stirs Import Broth

• House Small Business subcommittee schedules hearings to find out whether import controls hurt the little man. Oil companies get long questionnaire to answer.

A LENGTHY, detailed questionnaire covering virtually every segment of the oil industry has been mailed to several hundred oil firms by a House subcommittee.

The subcommittee, headed by Rep. Tom Steed (D.-Okla.), is planning extensive hearings on the impact of the oil import control program. The questionnaire is designed to provide the committee with data.

The hearing date has not been set, but it will likely be after the current session of Congress ends. It is expected that the hearings will last 2 weeks or more.

In a covering letter accompanying the questionnaire, Steed explains that the purpose of his Small Business subcommittee is to determine whether the import control program "is weakening the domestic energy industry and fostering monopoly control."

Steed said, too, that his group wants to determine whether governmental agencies have been giving enough consideration to small businesses in the oil industry.

The letter requests that the questionnaires, to be signed by a company officer under oath, be returned by September 6.

Producer questions . . . The questionnaire, divided into 6 sections, covers a wide range of subjects. One section for oil and gas producing companies asks for annual data on number of wells drilled, number of producing wells operated, average net working interest crude oil production per day, estimated shut-in crude production, number of shut-in wells, and average price per barrel received for crude oil on each January 1 for the past 5 years.

It also asks the producer whether his position in general has improved since the imposition of mandatory import controls.

Refiners . . . The question applicable to refiners covers crude throughput figures for the past 6 years, gross refining margin (before giving effect to the competitive advantage of foreign oil imported or exchanged) and, finally, the percentage of refinery runs represented by foreign oil.

Each refiner is also asked to what extent his crude oil import quota has been responsible for net refinery profit or has reduced refinery loss.

Another questionnaire calls for the annual percentage, since 1956, of refinery runs represented by residual fuel oil.

Finally, the refiner is asked what the impact upon his company would be if import controls were removed, or the quota exchange system were discontinued, or if imports of crude or residual fuel oil were further restricted.

Drilling companies . . . Statistics asked of drillers include annual figures on active rotary and cable rigs since 1956, number of contract wells drilled, total footage, average income per foot drilled, dollar value of new rig equipment purchased, and average number of crew men employed in U. S. operations.

Importers . . . Importing companies have 6 pages of questions relating directly to their operations.

The questions include amount of quotas and actual imports in specified periods, how much was imported in foreign flag and how much in U. S. flag tankers, residual fuel oil quota and import figures, imports from Canada and Mexico, prices paid for imported crude, and average tanker rates.

Exchanges . . . Detailed information is also sought on imported oil involved in exchange agreements.

These questions ask for details on amount of oil received and refined in these exchange agreements, on what basis each exchange was made, who processed the exchanged oil, the price of the crude oils involved, and whether or not any transfer of cash was included in any of these transactions.

Coal questions . . . The subcommittee is also sending a questionnaire to coal companies.

It asks about annual coal production, amounts sold for use as boiler fuel, annual production lost to imported residual oil, and coal employment figures.

FPC Policy Changes Again With New Members

• Now producers can't tell what price they'll get if they accept conditional permits. Swidler and Morgan refuse to go along in setting a "floor" price.

AN APPARENT new policy by the Federal Power Commission will put many natural gas producers in even more of a quandary over the price they will eventually receive for the gas they are selling.

In the past, when the FPC has approved a sale but conditioned the price on a later determination, it has specified a "floor" for that final price. This meant that although the producer might not get the full contract price for the gas, he would get no less than the "floor" price.

But last week the commission approved sales without setting any floor. The producers—if they agree to sell under these conditions—will collect the contract price until the FPC makes a final determination of rates. But they will then have to re-

fund the difference between the contract price and whatever price the FPC sets.

The move was obviously that of the two new commissioners, Joseph Swidler and Howard Morgan, because both Chairman Jerome Kuykendall and Commissioner Arthur Kline objected — although neither filed a formal dissent.

"Blind" price . . . Both Kuykendall and Kline warned that the new policy might kill projects because many producers may refuse to sell to an interstate pipeline at a totally "blind" price.

"A producer should not be required to commit his gas to the interstate market under circumstances where he will take a loss if the rate proves not to be compensatory," Kline said.

Commissioners Swidler and Morgan said they could not make a "floor" price determination at this time for the sales involved in the case upon which the ruling was based.

It would be more appropriate, they ruled, for the FPC to hold further proceedings upon the producer price issue later, and in the meantime the producers be permitted to collect the full contract price—subject to refund.

The issue was involved in the commission's authorization last week to Houston Texas Gas & Oil Corp. of St. Petersburg, Fla., and to Coastal Transmission Corp. of Houston to expand their pipeline systems to provide additional natural gas service to consumers in Florida.

Coastal Transmission will buy additional gas from sources in Texas and Louisiana for delivery to Houston Texas Gas & Oil. Other gas will be purchased from Southern Natural Gas Co.

The commission approved applications by 53 producers to sell to Coastal, but only on the condition that their rates be collected subject to refund later of any amounts determined by the FPC to be excessive. The producers' proposed initial prices range from a low of 13.5 cents in Texas up to 23.55 cents, including state taxes, in southern Louisiana.

There was no comment immediately available from the producers as to whether they will agree to sell their gas under these terms.

O'Connor Confirmed to FPC

. . . by 83-12 vote despite 3-day attack on Senate floor by Wisconsin's Proxmire. Swearing-in expected this week.

THE appointment of L. J. O'Connor, Jr., to the Federal Power Commission was finally confirmed last week after Sen. William Proxmire (D.-Wis.) had held the Senate floor for most of 3 days—and all one night—in a vain attempt to block confirmation action.

The Senate vote was 83-12.

It is likely that O'Connor will be sworn in this week, shortly after the return of Commissioners Joseph Swidler and Howard Morgan from a tour of gas facilities in the Southwest.

O'Connor, the third recent Democratic addition to the FPC, will replace Commissioner Arthur Kline, a Republican.

Interior has not yet named a successor to O'Connor to head the Oil Imports Administration. Tom Snedeker, O'Connor's top assistant, will be acting administrator until a decision is made.

The tirade loosed by Proxmire against O'Connor's appointment last week was one of the longest and most bitter against the oil and gas industry on the Senate floor in recent years.

Proxmire's principal assault on O'Connor was that the latter had continued to hold oil and gas stocks while serving as oil import administrator.

He also contended that O'Connor is the oil industry's "boy" and that his appointment further cements the industry's hold on the FPC.

For the most part, however, O'Connor's appointment was simply used by Proxmire as a peg for an all-out assault on the industry.

The senator said the industry makes fabulous profits and pays little tax.

He said natural-gas prices have soared and that the producer has been profiting at the expense of the "captive" consumer.

Proxmire said the oil industry already has too much influence in Washington, and claimed that the Kennedy administration has already "loaded" Interior oil-related posts with oil-industry figures. He said Navy Secretary John Connally is another oil-industry man who was given a key government oil-related job.

He added a great many other things during the 3-day talkathon, including an attack on oil's percentage-depletion provision.

During most of this time, the Senate chamber was virtually empty.

Proponents of O'Connor did nothing, waiting for Proxmire to get through so the confirmation vote could be taken. O'Connor had been approved unanimously by a Senate committee, and that normally is tantamount to approval by the full Senate.

Union-Ohio Group Finds Another Gas Field in Alaska

ANOTHER gas field has been discovered in Alaska, the second within 2 months. The operator promptly announced plans to walk away from the discovery and move north to look for oil.

Union Oil Co. says the Sterling unit 23-15 flowed gas at the rate of 5,900 M.c.f. daily from the Kenai formation at about 5,200 ft. The well went to 14,832 ft., but the bottom 65% of the hole was dry.

Union, unit operator, plans to move to the Knik Arm area about 15 miles north of Anchorage for its next test. The wildcat will be drilled in the Fish Creek unit at a location about 2 miles south of two core holes drilled last year.

Union and Ohio Oil Co., principal owners of Sterling unit, are the big holders in the new unit.

The SU 23-15 is near the unit's western edge and first test (OGJ, June 5, p. 52). The unit adjoins Kenai unit, where the Union-Ohio group has completed five gas wells.

The other recent discovery in Alaska was the 1 Falls Creek wildcat, which was completed by Standard Oil Co. of California and Richfield Oil Corp. Like the Sterling unit well, it was a deep hole completed as a shallow gas producer.

Marsh Advises FPC to Dump Area Pricing

• It may not be legal, says chief examiner, and even if it is, it will just start an endless series of problems.

THE CHIEF examiner of the Federal Power Commission has recommended that the commission abandon the area-pricing approach.

The examiner, Edward B. Marsh, clearly feels that it simply will not work.

"I am unable, in all fairness, to recommend the further pursuit of the area-wide rate method of procedure," Marsh declared last week.

His view is contained in a preliminary report on pre-hearing conferences he has been conducting on area pricing for southern and offshore Louisiana.

His report is being circulated among participants at the conferences to get their comments before the report is filed with the commission. Deadline for comment from conference participants on the Marsh report has been set for August 18.

Marsh, who also presided at prehearing conferences on area pricing for the Permian basin, said in his report that serious questions have been raised as to the legality and practicability of area-rate determination either for initial prices or rate hikes under old contracts.

Opinions . . . In addition to the question of legality, Marsh pointed out the wide range of conflicting views on proper regulation of gas producers and to general confusion stemming from a lack of clear-cut guidelines from the commission as to the type of evidence and procedure it wants.

He said that those who have gone on record favoring the area-price approach "are quite few in number and are found only among the distributors."

Others, he said, have shown no intention to abide unconditionally by an area-rate determination "regardless of the nature or amount of evidence adduced."

Problems . . . Marsh pointed out that just about any step the FPC takes toward area pricing will be challenged.

For instance, if the commission sets an area price, producers with contracts calling for a higher price will demand the right to justify that price.

All those with contract prices lower than the area price would immediately demand an increase to that level, at least.

On the other hand, if an area rate level higher than the lowest contract price were established, purchasers, distributors, and consumer-state commissions would demand the right to show in each instance that the resulting higher prices were not justified.

The net result, Marsh concludes, is that the area-rate procedure would result in as many complications as the commission has faced in the past—maybe even more.

Furthermore, even if the commission were to get over all these hurdles and establish area prices, it would immediately face the problem of adjusting these prices from time to time because of constantly changing conditions.

"It would seem that an area-wide determination is only the first of an endless series of proceedings which would be required to maintain appropriate rates," Marsh said in his report.

Confusion . . . Marsh also emphasized the complaint made by many producers and others that the FPC has left many questions unanswered.

These include:

. . . Scope of the area hearings.

. . . Procedures to be followed in such a hearing.

. . . Nature of evidence which will be received.

. . . Extent to which the producer may be permitted or required to present evidence and otherwise participate.

. . . Application to the producer of any final orders.

. . . Effect of this proceeding on a producer's pending certificate and rate applications already on file.

Alternative . . . Marsh outlined a procedure the commission might follow should it decide to go ahead with the area-price approach.

The plan includes these steps:

. . . Clarification by the commission, through supplements to Policy 61-1, of its position on key issues.

. . . Preparation by the staff of data required for the use of the "payout" method of initial rate determination.

. . . Setting a hearing to begin November 20 at which the staff would present its data, intervenors would present field-price information if they wished, and respondents would present such evidence as they desire, subject to rulings by the presiding examiner.

Marsh further recommends that before the November 20 hearing, if one is set, that there be another conference on November 6 in an effort to simplify and clarify the issues to be covered in the formal hearing.

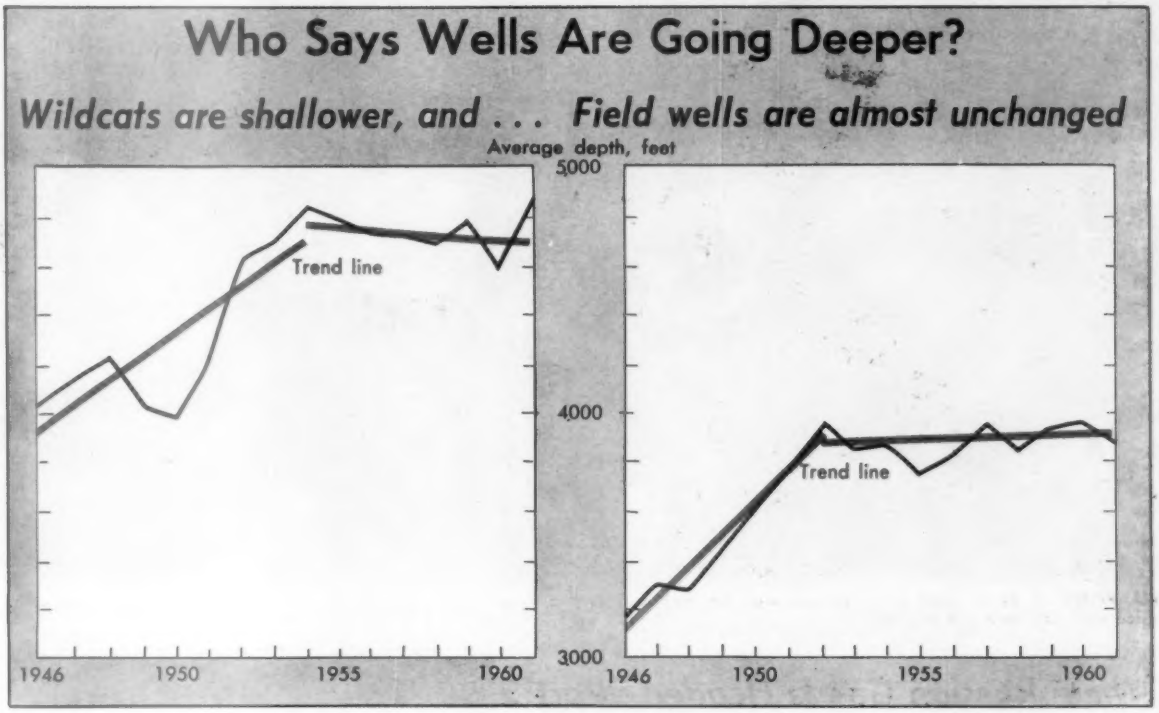
Gas Construction to Hit New Peak in '61

A RECORD $1.932 billion will be spent on construction by the U. S. gas industry this year.

This is the estimate of the American Gas Association, which reported a spending peak of $1.845 billion by gas-distribution and pipeline companies last year.

For the 4-year period of 1961-64, AGA's Bureau of Statistics estimated construction expenditures of $8.211 billion compared with $6.963 billion for the 1957-60 period.

In contrast to the general increase in industry investment, AGA estimates that only $732 million will be spent on transmission facilities in 1961. This is $100 million less than a year ago. The 1961-64 estimate for transmission investment is $2.6 billion compared with $3 billion in the earlier 4-year period.



Drilling-Depth Curves Have Flattened Out

THE trend is away from deep drilling.

The spectacular, deep wells are still getting the publicity. But the wildcat average actually began getting shallower in 1954. Field wells showed their sharp change in 1952. They're still getting deeper, but almost imperceptibly.

In the case of wildcatting, the trend line (above) definitely indicates shallower drilling. End points on the trend line dip from an average 4,791 ft. in 1954 to 4,722 ft. in 1961, a decline of 69 ft.

For development wells, the trend line indicates depths are greater but so slight as almost to be static. The end points rise only from 3,861 ft. in 1952 to 3,891 ft. in 1961, an increase in depth of 30 ft.

Oddly enough, drilling so far in 1961 contradicts both trends. Wildcat depths for the first 6 months have increased—an average 4,859 ft. compared with 4,601 ft. for all of 1960. Field-well depths have shrunk—3,853 ft. compared with 3,944 ft. for 1960.

The wildcat picture . . . There was a general increase in average depth of wildcat wells from the end of World War II through 1954 except for dips in 1949 and 1950.

The year 1954 seems to have been the break point, and the trend since then has a definite turn to shallower drilling. Contributing to the trend toward shallower wildcatting were:

. . . Greater activity in known shallow areas.

Kansas is an example. Wildcat drilling there increased 245 wells between 1954 and 1960, but the depth of the average Kansas wildcat was 891 ft. less than the national average in 1954 and 1,136 ft. less than the average in 1960.

. . . Drop in activity in deeper areas.

Texas' District 3 is an example. Average wildcat well in this district in 1954 was 3,286 ft. deeper than the national average and in 1960 was 4,381 ft. deeper. An increase here would have boosted the national average, but instead completion reports show 308 fewer wildcats in 1960 than 6 years earlier.

. . . Drop in activity in shallow areas where depths also are rising.

Kentucky's wildcat completions decreased 218 wells per year between 1954 and 1960. Since Kentucky normally is a shallow area, this drop in activity should have boosted the depth average. The unbalancing factor, however, was tendency of Kentucky wells to become even shallower. The average wildcat there was nearly 1,000 ft. shallower than in 1954.

The development picture . . . Average depth of field wells started leveling off in the early '50s after sharp gains in depths from 1948 through 1952.

Drilling depths shrank sharply for three straight years from 1952 to 1955 and have been up and down since.

There's a good chance for field drilling to become even shallower. Wildcat drilling tends to set the pattern for future development wells.

Oil being the uncertain business it is, however, any trend is subject to a quick change. And a few big discoveries in the 5,000-7,500-ft. range could set off a drilling program that would turn the average-depth line back up again.

WRAPPING of 40-in. pipe on a spread was watched by visiting Americans. Connole describes spread as "coed" operation, since half or more are women.

Where Russian Gas Is Headed—Part 2

Russian Pipelining Is More Than a Little

HEATING the water in a gigantic outdoor swimming pool with a surface area of 5 acres to a constant temperature of 74° F. even when the thermometer skids to minus 40° F., sounds like a gas man's try at "Can You Top This."

Actually, it is only one of the fabulous achievements of the soviet gas industry that the gas delegates saw in our month-long trip through the Soviet Union this July.

Located in the heart of busy Moscow, this pool is the only one in the city and is thronged with eager Muscovites, not alone for the enjoyment of so rare a luxury, but for the sense of participation in the splendor this people's government holds out to them, as well.

Here is more than an engineering and construction job of impressive, if slightly ridiculous, proportions. It is at once typical of much we saw in the Soviet Union.

In the first place, it is in Moscow, where an altogether disproportionate concentration of soviet achievements is centered.

Next, it is big, brassy, and ostensibly proletarian. Yet the average Muscovite must wait weeks, or months, for his turn at a ticket of admission—admittedly a sore point, even to loyal, water-loving members of the party.

Finally, it represents a conspicuous example of the flowering of communism — the more conspicuous, the better.

Contradictory country . . . Yet this is not an isolated example. The Soviet Union is a land of contradictions. It is building 2.7 million sq. meters of living space in a single year, almost equal to one quarter of the living space in all of prerevolutionary Russia.

Yet we never found a flight of stairs that fit! Only two sizes—too long or too short.

It prides itself that the communistic system does not employ women's or children's labor. Even the most recent announcement by the Kremlin condemns the free enterprise capitalistic system because it exploits women and children. Yet I had never before seen women gandy dancers laying in heavy steel rails or driving spikes with sledge hammers; or women hod carriers, scores of them!

It can successfully engineer pipeline networks, design and build machines to construct them and quadruple their mileage in 5 years, all to build up the living standards of millions of soviet citizens.

Yet I have never seen such incredible disregard for elementary measures of accident prevention and safety control for the thousands who were engaged in building the projects.

Accidents illegal . . . Take that last observation, for instance.

I observed to one of our hosts at one point that in 2 weeks around construction projects all over the Soviet Union, I had not seen one hard hat or pair of safety shoes. I was told that there were no accidents on these jobs. They were not permitted. If there ever were an accident, the responsible foreman would be jailed. This was supposed to act as a deterrent and to have eliminated the need for precautions designed to safeguard against accidents. Naivete? Lack of humanity?

AUTOMATIC WELDING on the Russian right-of-way is handled by this unusual machine.

PRESSURE WELDING demonstration was given visitors in research center just outside of Moscow.

This is the second in a series of articles written exclusively for the Journal by William R. Connole, former member of the Federal Power Commission. They are based on observations of the eight-member U. S. delegation of gas men which spent the month of July visiting soviet natural-gas installations. The first article appeared in the August 7 issue (p. 80).

Different

I do not think it was either. It simply typifies how marvelously oversimplified is life in the Soviet Union. When unpleasant factors intrude, they are simply outlawed!

But the purpose of this trip was not to observe these things, although deep impressions could scarcely be avoided in a land of such fascination and color. The American Gas Association had sponsored this exchange as part of the State Department's East-West Industrial Exchange Program to help acquaint the American gas industry with the progress being made by its soviet counterparts. In September the exchange will be completed when a team of 10 from the USSR will come to visit installations in the United States.

How gas is planned

GLAVGAS, the State Ministry of the Gas Industry, was our host. This industrial ministry, formed in 1956, has over-all direction of the industry, subject only to GOSPLAN, the top economic planning unit of the Council of Ministers.

In a word, they could not have been nicer. While, as one delegation member put it, we spent some nights in places where not even a pipeliner would stay, it was the isolation of the location and not the lack of hospitality of our hosts, that was the cause for such occasional inconveniences.

But it was worth it. We were shown, in great detail, the construction of pipelines, compressor stations, distribution systems, and gasoline plants. We visited operating drilling rigs (rotary table, turbo drill, and electric downhole), producing fields, water-flood projects, and gasoline plants. We saw the new developments on which the industry is working in several institutes.

Pipelining program . . . Pipeline construction is carried on much in the same fashion as in the United States. The selection and location is dictated by the long-range plan of the USSR, but the design and construction are the responsibility of GLAVGAS. Construction "trusts," similar to U. S. pipeline contractors, do the actual building. As in the U. S., specialized organizations—sort of "subcontractors"—do the road boring, river crossing, and compressor-station erection.

Before going out in the field to observe a spread in action, we visited the All Union Scientific Institute of Pipe Line Construction. This is one of the several institutes charged with research, planning, and training on an All-Union basis. The others include the Design Institute at Kiev and Leningrad, where the design of pipelines proper and the size, capacity and other economic and engineering matters concerning compressors are investigated. Another institute in Moscow itself designs and builds standardized domestic ranges and other house equipment for the entire Soviet Union. Although there are supposed to be several kinds of ranges available, we saw only one size—a small, four-burner, single-oven type without space heating equipment—in all the apartments we visited. The gigantic Trade Fair on the outskirts of Moscow featured another design, but I did not see it in any home.

The All-Union Scientific Institute

HOSPITALITY was the watchword, says Connole. Here the Russians were entertaining American visitors with a picnic at Axapovo. At left is Henry A. Eddins, president of Oklahoma Natural Gas Co.; in the center is E. H. Smoker, president of United Gas Improvement Co.; and on the right end is Baxter Goodrich, vice president of Texas Eastern Transmission Corp. E. H. Volski, interpreter for the U. S. group, is second from left.

for Natural Gas is located about 25 kilometers outside of Moscow in a brand-new series of buildings. This organization deals with questions of geology, economics, and other matters more of the big-dome variety.

Pipeline technology

Among other ideas we saw being developed in the Pipe Line Institute was a material for pipe wrapping called Brisol. Its chief constituent is bituminous with a rubber filler, the latter made mostly from used tires. This is a material developed in the Soviet Union and now being produced in 10 different plants. The engineers claimed this is superior to glass mat and that it would be used almost everywhere soon. On the lines we saw being built, however, there was no sign of its coming into general use as yet.

The material seemed to the delegation to be of excellent quality, however. It is applied in thickness ranging from 1½ to 2½ mm. We were told it is used for floors as well.

The soviets use no coal-tar-base materials of any kind, although they would prefer to use them because they perform better. While we were told that it is for reasons of avoiding possibly unhealthful contaminants, shortage of coal-tar derivatives in other sections of the economy would seem to point to unavailability as at least one more reason for lack of use.

Welding techniques . . . The welding labs produced some interesting developments. They are much more advanced in the area of automatic welding here than in the field. In the fields the crews use 30 to 35% hand welding. The goal is 85% automatic welding.

We saw an impressive technique for pressure welding at the Institute. Some experience has been had with field use of this method on line pipe of up to 700 mm. diameter, but it is largely experimental so far. The demonstration we saw under controlled conditions in the yard of the institute welded two sections of 700-mm. pipe in 2 minutes, 20 seconds, using a high-pressure (40 to 60 atmospheres) oil pump to press sections together and a diesel generator of 500-kw., 400-volt size.

We also witnessed semiautomatic welding techniques using a welding torch with flexible welding rod fed directly through this torch head. It is used for large-diameter pipe. An advanced method of automatic welding in a CO_2 atmosphere has been developed for use on large-diameter lines. The pipe remains stationary and the automatic welding head rotates about it. This method is not used in the field as yet. We did observe a large yard where triple jointing of 700-mm. pipe was carried on, using automatic submerged-arc welding machines with ceramic flux.

Inspection by tape . . . Perhaps one of the most interesting and useful techniques we observed was the use of a magnetographic method for weld inspection.

A section of magnetic tape is wrapped around the weld, flaws are recorded, and the tape played back on a portable oscilloscope-like device. Here the size and type of flaws are quickly and accurately identified by the amplitude and shape of the impulse. This seemed to us to be an efficient and rapid method, perhaps five times faster than more conventional methods.

The testing labs for steel line pipe use rather conventional methods, both destructive and nondestructive. Much of the testing machinery was manufactured in Leipzig. As a general rule, the goal is to maintain a wall thickness of about one one-hundredth of the outside diameter.

Based on field construction experience and laboratory testing, the soviet engineers concluded that line-pipe wall thickness and strength would be determined by tensile strength rather than yield point. Working pressures are selected to stress the pipe at half the tensile strength. The standard pressure on long lines is about 55 atmospheres (gage).

Another point developed at this institute was the failure of soviet practice to include an allowance for corrosion protection in wall thick-

ness. Russian engineers say cathodic protection and coating is depended on entirely.

The pipeline spread

We visited a field demonstration of many of the techniques observed in the institute. This was at Tula, south of Moscow. The spread was getting about 700 meters per day, on a 40-in. line. In general, the makeup of the spread was similar to U. S. practice—except of course it was co-ed, to the extent of 50% at least!

Welder's "signatures" . . . It was surprising to see welders' identifying marks on the joints, made with weld metal. This practice has long been abandoned in the U. S., of course. The scraping, cleaning, coating and wrapping machines employed steel wheels at point of contact with the line pipe, a practice not usually approved in the U. S. I also saw no evidence of insulation or protection surrounding the concrete antibuoyancy weights placed around the finished pipe at a swamp crossing. At the location we visited the line was being coated with asphalt-base enamels and wrapped in kraft paper. Some difficulty was being experienced with the machine and the weather was very hot. That may account for the lack of overlapping and frequent breaking. In general, however, it was a good, workmanlike job.

It was while spending the night at an oil workers' town near Tula, incidentally, that one member of the delegation, who shall remain unidentified in deference to the confidence placed in him by his board of directors, waged a losing battle with the controls of an ancient sputtering wall-type hot water heater in a community bathroom. He beat a hasty retreat a moment later when the whole works exploded in a cloud of steam. One of the brazed joints in the tubes had melted from lack of sufficient water!

Fascinating and detailed information was obtained on the many other techniques being used in the rapid development of the soviet gas industry. Some reports on these techniques and a discussion of the probable world-wide impact of the entire situation will be the business of the next article in this series.

Watching WASHINGTON

Clyde La Motte

• Swidler, Morgan search for impact on consumers . . .

INDICATIONS of the shift in emphasis at the Federal Power Commission are already shaping up, even though Joseph Swidler and Howard Morgan have been in their chairs only a few weeks.

The most apparent of these straws in the wind is the obvious intent of the new commissioners to consider the consumer impact of any given action.

An example:

Tennessee Gas Transmission filed a request with the FPC for permission to build compressor facilities to step up the capacity of its existing system rather than to go ahead now with construction of a 157-mile pipeline.

But the new commissioners raised some questions. Was it true that this would tend to force TGT to buy more gas in the higher-price southeastern Louisiana area? If so, wouldn't this increase the price to the consumer?

The net result was that the company was told to come back in September with more information on just what would be the difference—to the consumer—between the compressor-building plan and the pipeline-construction approach.

TGT spokesmen have already pointed out that the initial cost for the compressors would be around $6 million, whereas the pipeline would cost about $27 million. But FPC wants to be sure that over the long haul the higher gas costs wouldn't more than offset this difference.

• Interior may pare proposed right-of-way charge . . .

IT IS highly likely that the Government will modify its proposal to hike its charge on right-of-way across public lands.

As originally proposed, the old fee of $5 a mile would be boosted to $5 an acre (or any fraction thereof). This created a considerable stir among pipeliners, who figured this rental boost would hike their right-of-way costs several hundred per cent.

Interior is now giving the problem a second look, and appears inclined to reduce the minimum charge considerably.

• Interior faces a big legal test on import controls . . .

DON'T UNDERESTIMATE the importance of the recent suit filed by Standard Oil Co. (N. J.) challenging the sliding scale method of determining crude-oil import quotas for Districts 1-4 (OGJ, August 7, p. 78).

Jersey contends that the percentage figure applied to refinery throughputs should be the same for all concerned, regardless of size.

The issue itself is of considerable importance to refiners, both large and small, because it could mean an increase or a decrease in a company's crude-oil import quota.

Furthermore, should Jersey succeed in its attack on this point of the import program, it is to be expected that some who are unhappy with other phases of the program would be encouraged to take their problems to court.

And Interior, now in the process of considering regulation changes, will no doubt be aware of pressure it faces in having to go to court to uphold one or another of its moves.

Jersey's court test will also bring on an open clash between independent refiners and major companies.

SAMPLE NO. 46081

TABLE I

EVALUATION OF LEAD ALKYLS

	RESEARCH OCTANE NUMBER					
	97.0	98.0	99.0	100.0	101.0	101.5
	COST, CENTS PER GALLON					
TEL	0.1098	0.2275	0.3769	0.5482	0.7021	0.8519
25/75 TML/TEL	0.1587	0.2621	0.3852	0.5305		
MLA 250	0.1261	0.2092	0.3313	0.5149		
50/50 TML/TEL	0.1632	0.2532	0.3794	0.5550		
MLA 500	0.1426	0.2279	0.3575	0.5182	0.7562	
75/25 TML/TEL	0.1998	0.2819	0.3978	0.5699		
MLA 750	0.2019	0.2718	0.3682	0.5115	0.7537	
TML	0.2769	0.3817	0.4575	0.6293		

	CORRESPONDING MOTOR OCTANE NUMBER					
TEL	87.0	88.5	89.0	91.3	92.2	92.5
25/75 TML/TEL	87.5	88.5	89.5	90.5		
MLA 250						

WHICH ANTIKNOCK GIVES YOU BEST COST EFFECTIVENESS?

Ethyl's "MLA" and "TELMEL" antiknocks are proving to be highly effective and economical in many gasolines. This finding is based on an extensive evaluation program to aid refiners in selecting the best antiknock for their gasolines.

As an example, one refiner marketing a typical premium gasoline found he could save 1.9¢ per barrel, at the same Research octane number, by using "MLA" 250 instead of TEL.

In the program to date, over 300 gasoline samples, representing 80% of total refining capacity, have been knock-rated in the laboratory using eight "Ethyl" antiknocks in varying concentrations.

This program included approximately 16,000 ratings by Motor and Research methods alone. In addition, 500 bled manifold ratings have been made in an effort to predict the road performance of the various lead alkyls in cars with manual transmissions. Reid Vapor Pressure, distillation, hydrocarbon-type analysis, sulfur content and API gravity make up several hundred more individual determinations of quality that were run on these fuel samples.

The octane ratings from each sample were programmed through a computer to compare the cost effectiveness of each antiknock at several lead concentrations covering a range of octane numbers. In addition, the results show the octane numbers obtainable for a range of antiknock costs. In many cases, the mixed lead alkyls or "TELMEL" mixtures look more promising than either TEL or TML alone.

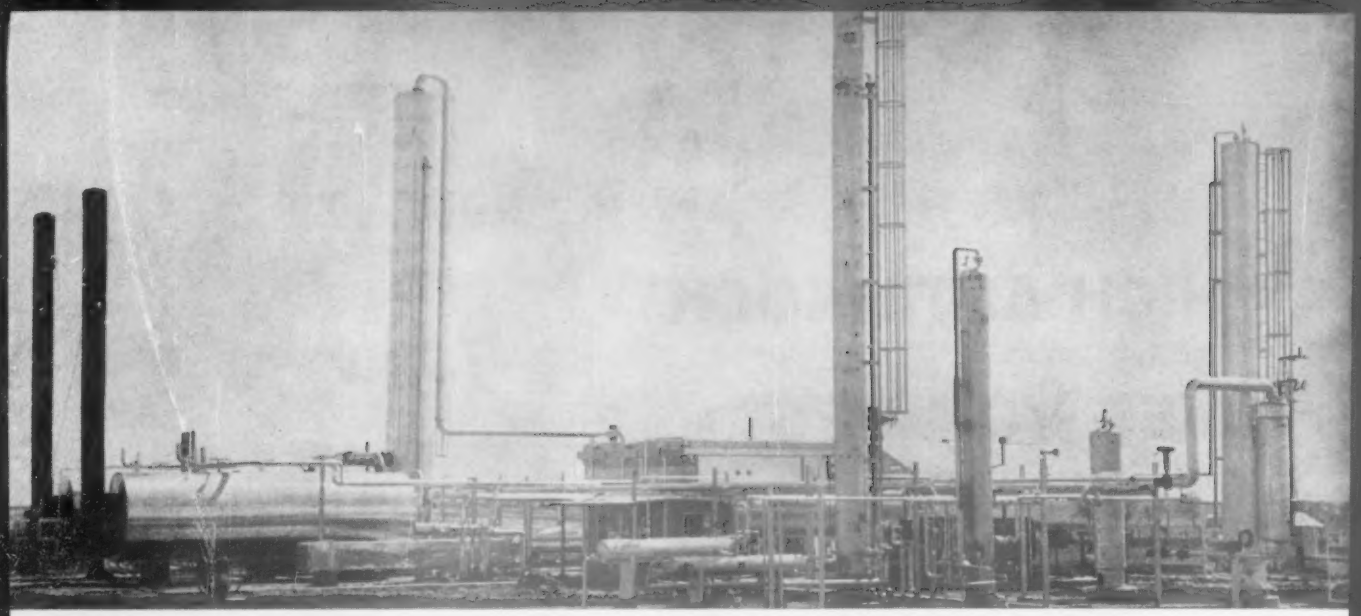
Based on laboratory findings, various combinations of gasolines and the new antiknocks have been selected for road rating studies. As a result, Ethyl's chassis dynamometers are running night and day to get the road ratings that complete the antiknock selection picture.

If you are a refiner facing the "which antiknock" question, and want help in the optimum selection, call your Ethyl Representative.

Ethyl Corporation

NEW YORK • TULSA • CHICAGO • HOUSTON • LOS ANGELES

ETHYL CORPORATION OF CANADA LIMITED, TORONTO • **ETHYL USA (EXPORT)** NEW YORK 17, N. Y.

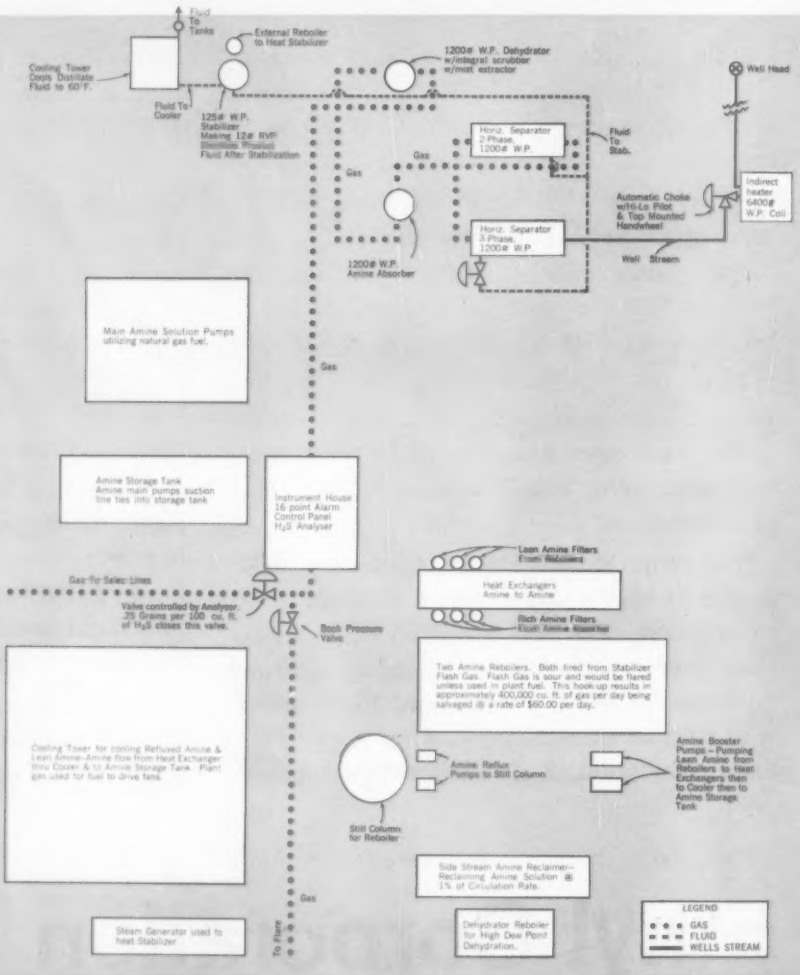


DESULFURIZATION + DEHYDRATION + HYDROCARBON RECOVERY

all-in-one package

This new Texas installation represents one of the most complete gas processing plants in America. The completed well was attractive from a hydrocarbon recovery standpoint, but the gas as it existed had no market value. The BS&B desulfurizing and dehydration processes enabled the operator to convert a valueless asset into a profitable venture.

This gas processing plant is a BS&B installation throughout, including galvanized bolted storage. It represents the kind of leadership which has become synonymous with BS&B. If you have plans for gas processing it would pay you to consult your BS&B representative.


Fluid To Tanks
External Reboiler to Heat Stabilizer
1200# W.P. Dehydrator w/integral scrubber w/mist extractor
Well Head
Cooling Tower Cools Distillate Fluid to 60°F.
Fluid To Cooler
125# W.P. Stabilizer Making 12# RVP (Maximum Pressure) Fluid After Stabilization
Horiz. Separator 2-Phase 1200# W.P.
Fluid To Stab.
Gas
Automatic Choke w/Hi-Lo Pilot & Top Mounted Handwheel
Indirect heater 6400# W.P. Coil
Horiz. Separator 3-Phase 1200# W.P.
1200# W.P. Amine Absorber
Well Stream
Main Amine Solution Pumps utilizing natural gas fuel.
Amine Storage Tank Amine main pumps suction line ties into storage tank
Instrument House 16 point Alarm Control Panel H_2S Analyser
Gas To Sales Lines
Valve controlled by Analyser. .25 Grains per 100 cu. ft. of H_2S closes this valve.
Back Pressure Valve
Lean Amine Filters From Reboilers
Heat Exchangers Amine to Amine
Rich Amine Filters From Amine Absorber
Two Amine Reboilers. Both fired from Stabilizer Flash Gas. Flash Gas is sour and would be flared unless used in plant fuel. This hook-up results in approximately 400,000 cu. ft. of gas per day being salvaged @ a rate of $60.00 per day.
Cooling Tower for cooling Refluxed Amine & Lean Amine–Amine flow from Heat Exchanger thru Cooler & to Amine Storage Tank. Plant gas used for fuel to drive fans.
Amine Booster Pumps – Pumping Lean Amine from Reboilers to Heat Exchangers then to Cooler then to Amine Storage Tank
Amine Reflux Pumps to Still Column
Still Column for Reboiler
Side Stream Amine Reclaimer–Reclaiming Amine Solution @ 1% of Circulation Rate.
Steam Generator used to heat Stabilizer
To Flare
Dehydrator Reboiler for High Dew Point Dehydration.
LEGEND
GAS
FLUID
WELLS STREAM

DESIGN SPECIFICATIONS

Design capacity—7.5 million ft. in winter
5.0 million ft. in summer
1200# W.P. design
Well flowing pressure — 2750 psi.
Inlet temperature — 95° F.
Total Acid Gas Content 9.72%

GAS SALES SPECIFICATIONS

Sulphur content—.25 grains per 100 SCF
Water content—7#/MMSCF

PLANT PERFORMANCE

Average H_2S content — .03 grains per hundred SCF.
(The H_2S content has never exceeded .04 grains per hundred SCF.)
Hydrocarbon recovery—72.5 BBLs of 12# RVP product per MMSCF.

BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • KANSAS CITY • TULSA • EDMONTON • THE HAGUE

How Engineers' Salaries Compare . . . 1960 Median income

Year of entry	Chemical	Civil	Electrical	Industrial	Mechanical	Mining & Metallurgical	Petroleum	Other
1960	(*)	5,300	6,190	(*)	5,710	(*)	(*)	(*)
1959	(*)	6,180	7,060	6,920	6,670	(*)	(*)	(*)
1958	(*)	6,700	7,320	(*)	7,070	(*)	(*)	(*)
1957	7,320	7,130	7,960	(*)	7,650	(*)	7,300	(*)
1956	(*)	7,500	8,370	(*)	8,070	(*)	7,350	7,690
1955	(*)	7,900	9,130	(*)	8,470	(*)	(*)	8,840
1954	(*)	8,020	9,270	(*)	8,950	(*)	(*)	8,300
1953	8,900	8,300	9,420	(*)	9,110	(*)	(*)	8,850
1951-52	9,330	8,990	10,030	10,100	9,940	11,000	9,500	9,870
1949-50	10,630	9,650	10,370	10,670	10,360	11,500	10,400	10,630
1947-48	11,410	10,470	10,940	11,460	11,020	(*)	11,560	11,290
1945-46	13,500	10,410	11,030	(*)	11,180	(*)	(*)	11,390
1943-44	11,860	11,090	11,860	11,670	12,020	(*)	(*)	12,880
1940-42	13,450	11,120	12,430	12,330	12,070	12,830	13,580	13,420
1935-39	14,920	11,560	12,250	14,160	12,640	12,700	16,560	13,880
1930-34	15,680	11,300	12,240	15,360	13,730	17,160	16,920	12,670
1925-29	15,860	11,490	13,040	15,340	13,440	13,000	17,580	14,360
1920-24	15,500	11,620	14,500	15,500	13,960	14,200	21,000	13,570
1915-19	(*)	11,110	12,170	(*)	13,000	(*)	(*)	15,340
1914-& before	(*)	11,540	10,800	(*)	10,750	(*)	(*)	12,500

*Fewer than 20 replies. Source: National Society of Professional Engineers.

Engineer Salaries Reach Record Level

• Recent graduates and old hands are up some in salary, but the real gains are being made by the 10-year veterans.

MEDIAN income of professional engineers rose to a record $10,660 last year—6.6% above 1958.

Engineers in the middle-income brackets had the largest gains. Those at the top and bottom of the earnings scale advanced somewhat more slowly.

The National Society of Professional Engineers' fifth biennial survey shows its members are making 35% more than in 1952. In comparison, U. S. manufacturing workers, who now average about $90 a week, had a 34% pay increase over the same period. Total U. S. personal income expanded 47%.

Engineers who started to work in 1914 and earlier, and by now are part of top management or have other high-paying jobs, added only $340 to their income since the 1958 survey. The up and comers, those with experience going back to 1949-50, chalked up the best gain—$1,380.

Of the 24,000 engineers who replied to the survey, 90% earn at least $7,140 a year, and 10% are on the $19,680 level.

Mining and metallurgical engineers have the top median—$11,720. At the other extreme are agricultural engineers, who earn $7,750. In between are:

"Others," whose work is in several engineering fields, $11,620; chemical, $11,530; aeronautical, $11,460; industrial, $11,210; electrical, $10,950; petroleum, $10,860; mechanical, $10,720; and sanitary, $10,560.

Petroleum engineers who started out in the 1920's and 1930's when oil-industry technology was making great strides, earn as much as $5,000 more than other kinds of engineers with the same length of experience. But it's a different story for the young PE's. Their median earnings are less than other beginners.

The average engineer doesn't make a killing right out of college. The survey says it takes a decade to reach the $10,000-a-year bracket.

Other trends noted in the report:

. . . **Salaried engineers** are gaining a little on their self-employed counterparts. Salaried professionals' median is $10,300 against $15,480 for those who work for themselves—a difference of $5,180. The spread was $6,440 in 1958.

. . . **Geographical differences** in pay seem to be decreasing. Engineers in the New England and Middle-Atlantic states are best off—$11,350. Those in other areas make $10,000 or better, except in the Plains states where the median is $9,680.

. . . **The gap between** earnings in industry, public utilities, education, and the federal Government is narrowing.

An engineer with 10 years' experience earns $10,690 as a construction contractor; $10,460 in industry; $10,200 in education; and $8,680 in state government; $9,170 in utilities; and $9,930 in federal government service.

Of the engineers taking part in this survey, 29% have worked their way into executive-administration jobs. Next most popular is design work—25%. The others are split this way: consulting, 11%; construction supervision, 9%; production and maintenance, 8%; research and development, 8%; sales 5%; teaching, 2%; and other types of work, 3%.

More people are turning to engineering as a career, the survey indicates.

Watered-Down Gas Tax Bill Passed in Texas

• Severance-beneficiary measure would affect only 20% of gas produced in Texas. But it hits pipeliners, and they're expected to fight it in court.

THE Texas Legislature last week finally passed a patchwork version of Rep. Bob Eckhardt's severance-beneficiary gas tax. But, in the process, it watered the bill down with amendments to a point where it will affect only about 20% of total gas produced in Texas.

It did this through inclusion of an amendment which appears to exempt most gas processed by gasoline plants. Eckhardt said in a statement prior to passage of the amended bill that gas reports of the Texas Railroad Commission show the effect would be to exempt 79% of all Texas-produced gas.

The amendment, adopted by a conference committee and then approved by both houses, read: "No person or persons operating one or more gasoline plants shall, in respect to residue gas after processing in said plants, be liable for any tax hereunder."

Revenue-wise, the amendment would cut down state take from the bill to about $3,000,000 per biennium from a previously estimated $12,000,000 to $15,000,000.

Questions raised . . . On the face of it, the tax now would fall only on dry gas. But a deeper examination indicates it's not that simple.

Many in the industry already are wondering what the status is of a gathering company which buys and gathers the gas from a producer and then resells it to a gasoline plant. Apparently, the gathering company would be the severance beneficiary under the bill and would have to pay the tax.

The tax rate in the measure was left unchanged. It would levy a total tax on gas of 1 cent per M.c.f. The intent is that the severance beneficiary—normally the pipeline—will pay the difference between that amount and the present production tax of 7% of value at the wellhead. Effective date is September 1.

Pipeline attorneys, however, have contended that the bill is attempting to tax the pipeliner by the simple expedient of calling him a producer. The purchaser of gas is not a producer and can't be made one simply by calling him one, they contend.

It is considered virtually certain that Gov. Price Daniel will sign the huge revenue-raising measure of which the new gas tax is a part. And it is thought just as certain that the pipeline companies will go into the courts to overturn it, just as they did with two previous Texas severance-beneficiary taxes.

Pollution bill passes . . . Also just getting in under the gun prior to the close of the special session at midnight August 8 was a bill setting up a Texas Water Pollution Control Board and new pollution-control mechanisms.

Oilfield-type pollution from producing and drilling operations is left under the jurisdiction of the Railroad Commission. But the new board will control all other discharging of wastes into either fresh or salt waters.

Under the bill, any plant wishing to discharge waste materials into or adjacent to public waters would first have to get a permit to do so from the board.

The law, if signed by the governor, would take effect November 1, 1962. In the meantime, present pollution laws would remain in effect. Also, firms now discharging wastes would be required to apply for permits prior to November 1 to continue such discharges.

The new six-man board would be composed of the chairman of the State Board of Water Engineers, the executive secretary of the State Game and Fish Commission, the state health commissioner, and three appointees of the governor.

Calvert, Mid-America Buying Blackwell

A VETERAN Oklahoma producing company plans to dissolve and sell most of its assets for $4,750,000 to Calvert Exploration Co., Tulsa, and Mid-America Minerals, Inc., Oklahoma City.

Calvert and Mid-America will jointly buy Blackwell Oil & Gas Co.'s leases and certain other assets. Calvert will operate the producing properties and will absorb most of Blackwell's operating staff.

Target date for completing the deal is December 1. Blackwell stockholders will vote August 30 on the proposal.

Blackwell, a Tulsa-based company, will dispose of its remaining assets elsewhere and distribute all proceeds to stockholders.

The 57-year-old firm owns interest in 290 wells in Kansas, Louisiana, Oklahoma, and Texas—including several water flood operations. It holds some 45,000 acres of nonproducing leases in Arkansas, Colorado, Kansas, Louisiana, Montana, New Mexico, North Dakota, Oklahoma, Texas, Utah, and Wyoming, plus one-third interest in 2,200,000 acres in Bolivia.

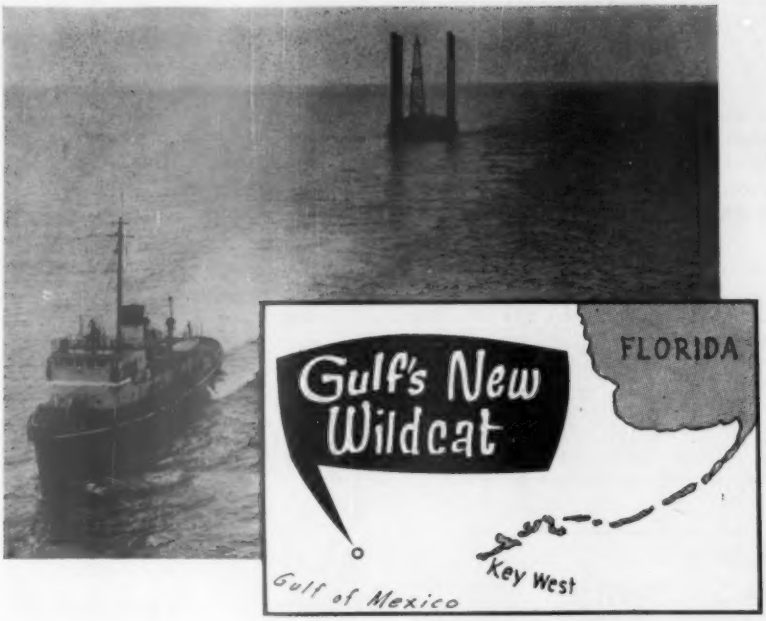
Both Calvert and Mid-America are experienced flood operators. In addition, Mid-America operates the 88-well Blanco field in San Juan County, New Mexico, and has three rigs running in Beaver County, Oklahoma.

PROCESSING

Gas processing plant with a capacity of 30,000 M.c.f.d. will be built by producers in Normanna field, Bee County, Texas. The plant will produce about 1,200 bbl. daily in addition to separator condensate. Tidewater Oil Co. and Dougherty estates hold the major interests.

Two hydrogen treating units with a combined capacity of 25,000 bbl. per day will be installed by Shell Oil Co. at its Anacortes, Wash., refinery. Fluor Corp. is contractor.

Vinyl acetate compounds will be produced in a $4 million plant to be built by National Starch and Chemical Corp. Location was not



Offshore Florida Test Starts

GULF Oil Corp. and California Oil Co. are making their third joint effort to find oil on a huge block of leases they acquired off Florida in 1959.

The new well, using air drilling equipment, is prepared to go to 17,000 ft. if findings at higher levels justify a test that deep.

The drilling site is in Block 46, about 40 miles west of Key West. The well is the Marquesas No. 1.

Offshore Co.'s Rig 52, drilling in 70 ft. of water, drove a 36-in. conductor pipe about 100 ft. into the gulf floor and then drilled to 861 ft. to set 20-in. casing. The test had been scheduled to start in May, but use of the rig was delayed until this month.

Gulf and Calco paid $1,711,872 in August 1959 for 22 tracts covering 132,480 acres in the area west of the Marquesas Keys. Since that time they have jointly drilled two dry holes.

Gulf, as operator, supervises drilling out of its Jackson, Miss., district office.

Photo shows Rig 52 being towed to location of the new wildcat.

First Hydrocracking Unit Put on Stream at California Plant

THE refining industry's first hydrocracking unit has gone on stream at the 15,400-bbl. refinery of Powerine Oil Co. at Santa Fe Springs, Calif.

The 2,500-bbl. Lomax unit, licensed by Universal Oil Products Co., will produce a yield of 120% of its need. The charge is either diesel fuel with a boiling range of 440° to 656° F. or thermally cracked gasoline with a 220° to 425° F. boiling range.

Operating details of the new unit are being kept under wraps until it is on stream longer.

The unit is designed for a hydrogen capacity of 6 million cubic feet, but started operating with 5 million. Hydrogen will come from three Platformers, including a new 2,500-bbl. unit. The plant's platforming capacity is 5,700 bbl. daily or 37% of the crude capacity.

Several other hydrocracking units are going up in the industry. The biggest is a 20,000-bbl. Isocracker which will be built at Tidewater Oil Co.'s Avon refinery near San Francisco.

BRIEFS . . .

identified but the firm says two sites along the Texas Gulf Coast have been optioned. Capacity will be 45 million pounds annually.

Delayed-coking unit will be built by Texaco Inc. at its Lockport, Ill., refinery. Construction of the 28,000-bbl. unit will begin this month with completion scheduled for mid-1962. Foster Wheeler Corp. is contractor.

Phthalic anhydride plant with 30 million pounds yearly capacity will be built by Oronite division of California Chemical at the Perth Amboy, N. J., refinery of California Oil. Both companies are subsidiaries of Standard Oil Co. of California. Orthoxylene will be used as feed stock, in vapor-phase process developed by California Research Corp. Oronite also is expanding its orthoxylene capacity more than 100 million pounds at Richmond, Calif.

A new refinery will be built at The Pas, Manitoba, by Canadian Kodiak Refineries, Ltd. Completion of crude facilities at the $4.5 million, 3,000-bbl. installation is set for the end of this year. Cracking, reforming, and hydrodesulfurizing units are to be finished by May 1962.

Gas-processing plant in King field, Lea County, New Mexico, has been purchased by Sinclair Oil & Gas from Cabot Corp. Sinclair plans to add another gas compressor, a cooling tower, and refrigeration equipment to bring capacity up to 6,000 M.c.f.d.

Natural gasoline plant will be built by Cities Service Petroleum Co. in Calhoun County, Texas, about 4 miles north of Seadrift. The 10,000 M.c.f.d. plant will be the refrigeration-absorption type. Austin Rankin Corp. of Houston is contractor.

Safety paid off this month for the 252 employes of Texas Butadiene & Chemical Corp.'s plant near Channelview, Tex. The company collected a $6,300 rebate on workmen's compensation insurance because the plant operated 3 years without loss-of-time accident. This was divided among the workers.

Runs Miss Record by Only 8,000 Bbl.

REFINERS are keeping their crude runs at near-record highs.

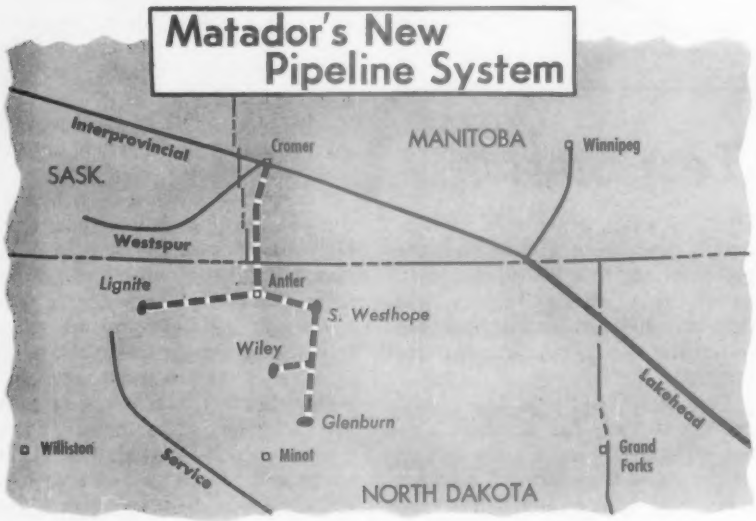
Operators during the week ended August 4 ran 8,466,000 bbl. daily of crude to stills, an increase of 69,000 bbl. daily over the previous week and the second highest weekly average on record.

The record for weekly runs is 8,474,000 bbl. daily set during the week ended March 3 this year.

Runs during the first week in August last year averaged 8,254,000 bbl. daily or 212,000 bbl. daily less than the same week this year.

Despite the high runs last week, gasoline stocks dropped 1,098,000 from the week earlier and now total 193,042,000 bbl. Compared to last year, gasoline stocks were off 605,000 bbl.

Inventories of the four major products, however, climbed 1,427,000 during the week to 407,689,000 bbl. That puts them 6,277,000 bbl. higher than at this time last year.



Canada Okays Matador Line

- North Dakota crude will get pipeline connection with Lake refineries for first time. Tariff will drop, too.

A 175-MILE pipeline which will give North Dakota crude its first pipeline connection, via Canada, to Minnesota and Wisconsin refineries has been approved by the National Energy Board.,

The NEB authorized the 54-mile Canadian section of the 8-in. line which will extend from fields in Bottineau, Renville, Ward. and Burke counties to Cromer, Man. There the project — proposed by Matador Pipe Line Corp., Denver— would connect with Interprovincial Pipe Line.

Through Interprovincial's Lakehead extension in the U. S. and a connection with Minnesota Pipe Line, the crude will reach the Duluth - Superior and Minneapolis - St. Paul refineries now receiving North Dakota oil by rail.

Since March of 1960 this oil has been moving for 70 cents a barrel for both rail and joint rail-pipeline transportation to the two markets. The new pipeline will reduce the tariff by 6 cents to the Twin Cities and by 20 cents to Duluth-Superior.

This saving, expected to be added to the producer's netback, should spur increased development in northern North Dakota.

The pipeline, with a 200-hp. pumping station at Antler, N. D., 4 miles south of the international boundary, could deliver 15,000 bbl. daily to Interprovincial.

Matador Pipe Line is headed by Cortlandt S. Dietler, Denver, president of Western Crude Marketers, Inc. Trans-Prairie Pipelines, Ltd., Edmonton, Alta., has a contract to manage the construction of the $3,760,000 project and later its operation and maintenance for a $3,500 monthly fee. Trans-Prairie will participate in the equity financing to the extent of 15%, or $75,-000.

Alaskan Gas Line Going Into Service Late This Month

GAS WILL START moving through an 80-mile, 12-in. gas line from Kenai gas field to Anchorage late this month.

The line is now being pressure tested after twin 12-in. lines were laid under Turnagain Arm. The 6-mile submarine job was handled by J. Ray McDermott Co.'s big barge, Tidelands, after an attempt to cross the arm last year failed.

The line will have a capacity of about 70 million cubic feet daily.

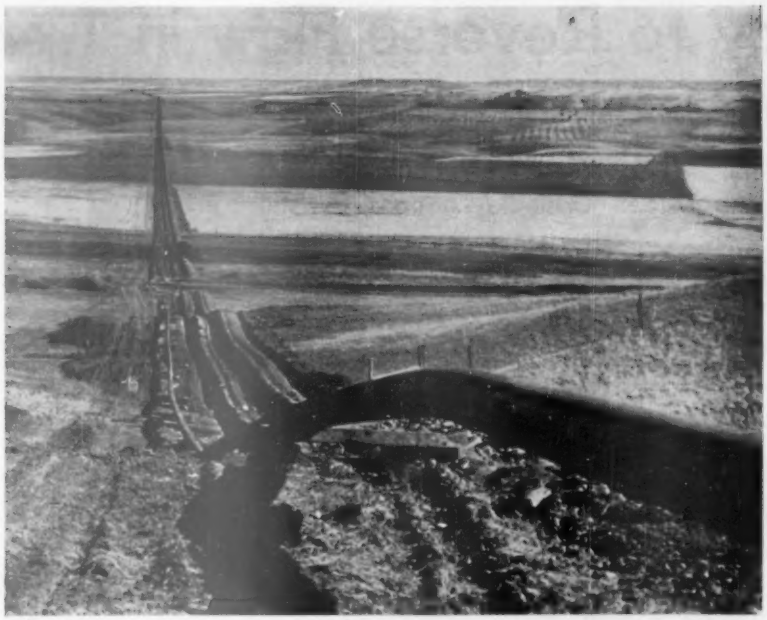
Alaska Pipeline Co. is operator of the line.

INDUSTRY

A new plant to manufacture plastic oil-field pipe from Delrin will be built at Tulsa by Du Pont. Capacity will be 5 million pounds per year. Completion is set for next summer.

Proposed acquisition of Standard Oil of Kentucky will be considered by Standard Oil of California stockholders at a special meeting September 7. Socal stockholders of record August 10 will be eligible to vote (OGJ, June 12, p. 81).

Aluminum drill pipe will be tested by two companies. Brinkerhoff Drilling, Denver, has bought 13,000 ft. of 4½-in. for use in the Rocky Mountain area. Prime Drill-



MILD Montana winter made it possible to lay pipe ahead of schedule.

Glacier Crude Line Already Operating

CONSTRUCTION on the 430-mile Glacier pipeline in Montana and Wyoming is finished, and crude from Montana oil fields is now moving to refinery centers.

Continental Oil Co. and Texas Pipe Line Co., joint owners of the $13.5 million line, began work in late autumn and, thanks to relatively mild weather in the rugged Montana country, were able to lay line through most of the winter and complete it in "record time."

The line ties in the fields of northern Montana near Cut Bank with the refining centers of Billings and Laurel in southern Montana and continues on to Byron, in northern Wyoming, where it connects with the Platte Pipe Line.

Continental is operator of the line through the Glacier Pipe Line Co.

McLaughlin, Inc., Great Falls, Mont., and R. H. Fulton, Lubbock, Tex., were general contractors on the line.

New Scouting Service to Cover Operations in Nine-State Region

OIL COMPANIES in a nine-state area in the Illinois, Michigan, and Appalachian basins can subscribe to a new well-reporting service. It will start operating October 1.

Well Record Service, Denver, says clients will receive data on well locations, wildcats, and completions.

Offices will be opened at Evansville, Ind., and Columbus, Ohio. Scouts and reporters will be stationed at Lansing, Mich.; Mount Vernon, Ill.; Owensboro, Ky.; Pittsburgh and Bradford, Pa.; Charleston, W. Va.; and Canton, Ohio.

The new service proposes one departure from other contract-scouting services. Coverage will be furnished to independent operators, through current reports and cards, as well as to major operators. Charges range from $450 to $1,100 monthly, depending on scope of coverage.

Some companies which have subscribed to the new service have scouts in the Tri-State scout check at Evansville, which handles information in Illinois, Indiana, and western Kentucky.

Well Record Service was the first commercial-well data-gathering organization. It started service in 11 states 2 years ago.

BRIEFS . . .

ing, Wichita, Kans., has ordered 5,250 ft. of 4½-in. for use in southwestern Nebraska.

Oklahoma's oil allowable has been continued at 13 bbl. daily per well for August and September. The State Corporation Commission estimates production will be 505,000 bbl. a day.

A wildcat reported as the discovery well in Butte Creek field of California's Sacramento Valley has been abandoned. Occidental Petroleum Corp. and Standard Oil of California's 1 Sacramento Outing Club in Section 12-16n-1w of Sutter County flowed at the rate of 2,530 M.c.f. daily from 3,897-3,949 ft. (OGJ, July 17, p. 134) but the zone is considered noncommercial. The test went to 7,639 ft. before being plugged.

Esso Safety Foundation is moving from New York to Houston, headquarters of Humble Oil & Refining, and changing its name to Humble Safety Foundation. The agency works with public, private, and educational groups to improve highway safety.

In a court filing, Continental Oil has contended that its leasing of the Malco refinery at Artesia, N. M., caused greater competition—not less—in the battle for markets in the New Mexico-West Texas area. The claim was made at Albuquerque in reply to a Justice Department antitrust civil suit brought against the company in May.

McElroy Ranch Co., Bakersfield, Calif., has changed its name to Franco Western Oil Co. McElroy grew out of a merger last December between Franco Western and Franco Central oil companies.

Shell of Canada has applied for exploratory permits covering about 11 million acres of offshore lands along the western coast of Vancouver Island and in Queen Charlotte Sound. This will be Shell's first offshore activity in Canada.

New Oil Policy to Reverse Flow in Trans-

• Line was built to move Montreal products to western Ontario, but it's caught in the middle of a new plan to supply this area from Toronto—which processes Canadian crude. Outlook: Changes, but still a profit.

NOW THAT Shell Oil Co. of Canada, Ltd., has confirmed plans to build an Ontario refinery, reversal of the Trans-Northern Products line seems assured.

Shell's announcement of the 31,000-bbl. refinery at Trafalgar, Ont., near Toronto, will mean a shift to Canadian crude for the company's markets west of the Ottawa Valley. This will be done to comply with the national oil policy announced February 1.

The Trans-Northern Pipe Line Co. system has been the principal means of transferring products refined from foreign crude in Montreal into Ontario. This volume has been around 70,000 bbl. daily, with some 50,000 bbl. daily moving west of the Ottawa Valley.

Since Ontario west of the Ottawa Valley is to be fenced off for Canadian supplies, a shift in supply sources will be required for the 50,000 bbl. And this in turn will force a rearrangement of Trans-Northern, which is caught in the middle by the oil policy.

Trans-Northern operations . . . Trans-Northern started operating its 442-mile 8 and 10-in. line between Montreal and Hamilton, Ont., in 1952.

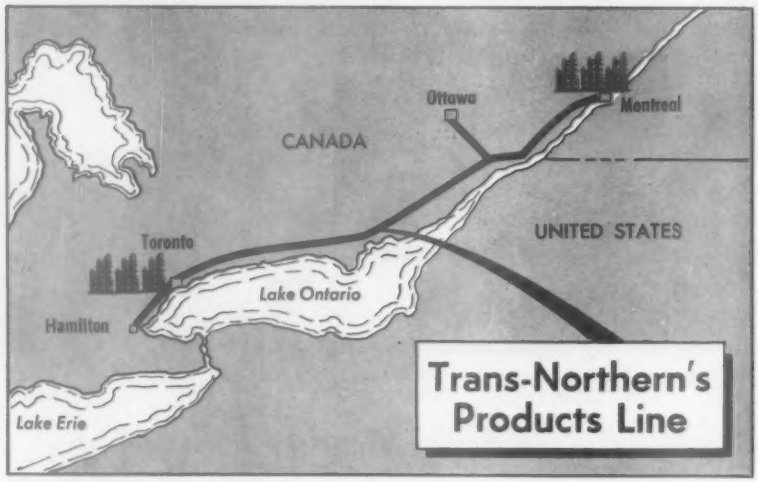
The main line is 10 in., with capacity of 72,000 bbl. daily. An 8-in. lateral extends to Ottawa.

Trans-Northern is owned by Shell; Texaco Canada, Ltd.; and British American Oil Co., Ltd.

Canadian Petrofina, Ltd., and BP Canada, Ltd., two other Montreal refiners, also ship on the line.

Prime movement on the line is from Montreal westward to Toronto and Hamilton. The line also pumps from Clarkson (British American) and Port Credit (Texaco) refineries west of Toronto to the Toronto area.

Shell and Texaco account for most of the 50,000-bbl.-daily movement of Montreal-refined product west of the Ottawa Valley. Of the two, Shell's movement is the larger.



British American, Petrofina, and BP Canada report they are already using domestic sources for essentially all markets in the Ontario area allocated to domestic supplies.

Texaco last year expanded its Port Credit refinery from 20,000 bbl. daily to 26,000 bbl. daily through bottleneck removal. It is studying other means of expanding its domestic supply for Ontario.

The Shell refinery is to be completed in 1963. Then the shift in supplies demanded by the government in the voluntary oil policy will have been largely completed. The big Montreal-Toronto products flow on Trans-Northern will be curtailed if not halted, forcing a major rearrangement of the line's operations.

Trans-Northern future . . . Trans-Northern and its shippers have considered numerous possible methods of future operation under changes wrought by the oil policy.

At this early date nothing final has been worked out, but these seem to be good bets:

. . . Continuation of shipments from Montreal to the Ottawa Valley, which is considered part of Montreal's natural market.

. . . A decline in the Montreal-Toronto movement in 1961 and 1962, with most of the volume shut off after the Shell refinery goes on stream in 1963.

. . . Some Montreal-Toronto movement of distillate during 4 months of the heating season when Ontario refiners running Canadian crude can't meet demand with a balanced operation.

. . . Eastward shipments from British American, Texaco, and Shell

PIPELINE

A 16-in. 24-mile line to three gas fields off Santa Barbara County, California, is planned by Pacific Lighting Gas Supply. The line will run from the fields to Goleta, where it can go into underground storage or into the line of two PLGS distribution subsidiaries, Southern California and Southern Counties Gas. The three fields are operated by Standard Oil of California, Phillips Petroleum, and Texaco.

Revenue of the 72 oil pipeline companies reporting to the ICC was up 0.2% in the first quarter of 1961. Of the 72, 41 showed increases, 31 decreases. Two products lines, Shamrock Pipe Line

Northern Line

refineries from the Toronto area to supply markets in the gap between the Ottawa Valley.

. . . **New shippers** in the Toronto area to increase business and compensate for loss of the lucrative long-haul volume from Montreal to Toronto.

The middle section of the line, traversing areas of light demand, may be idle part of the time. Trans-Northern may not operate part of this section except during the winter when Montreal-Toronto shipments are revived, because of the infrequent deliveries required.

Whatever the changes, Trans-Northern will have to modify manifolding and pumping machinery.

However, this can be done without major capital investment. The greatest cost will probably be in shipper terminal changes due to the altered operation. The pipeline operates no terminals.

In spite of losing its long-haul traffic, Trans-Northern is expected to continue to earn its debt obligations. The pipeline does not contemplate having to fall back on shipper-owners to bail it out of financial trouble.

Canadian push eastward . . . When Trans-Northern is partially reversed, it will mean another in a series of eastward advances of Canadian crude.

The march to the east, toward the populous centers of demand, began in 1947 with the big Alberta discoveries which promised Canada eventual self-sufficiency in oil. In 1947, Canada supplied less than 10% of its own crude needs.

By 1954, rapidly expanding Alberta and Saskatchewan production took over 55% of the home market. Interprovincial Pipe Line was extended to Sarnia, Ont., and then to the Toronto area. The construction of Trans-Mountain Pipe Line to Vancouver also gave most of the British Columbia market to Canada.

Since 1954, Canadian refinery runs of domestic crude have grown steadily. However, in this period they have expanded more in proportion to economic growth than at the explosive rate which occurred while imports were being backed out.

By the end of 1963, through further displacement of imports, Canada should be supplying about 60% of its own crude demand. It will have penetrated almost to the Quebec border.

At that time only the Montreal and Maritime refineries in Canada are expected to be running appreciable volumes of foreign crude.

Computer Will Control Ammonia Plant

AN 875-TON ammonia plant is scheduled for computer control.

Allied Chemical Corp.'s nitrogen division is installing a TRW Computers Co. RW-300 at its Ironton, Ohio, plant. The Allied plant is the biggest ammonia plant for which computer control has been announced.

The computer is scheduled to go on stream by the end of this year. During initial operations, it will have only partial control, but it is designed for closed-loop control of the big ammonia works. The unit also will have capacity to be extended to other operations at Ironton.

The RW-300 will sense more than 300 process variables and control 60 variables. The unit will have a memory capacity of 16,000 words or 288,000 digits.

TRW Computers has a similar unit at Monsanto Chemical Co.'s 500-ton Luling, La., ammonia plant and another controling vinyl chloride and acrylonitrile production at B. F. Goodrich Chemical's Calvert City, Ky., plant. RW-300's also have been installed at Texaco's catalytic polymerization unit at Port Arthur, Tex., and at Gulf Oil Corp.'s 60,000-bbl. cat cracker at Philadelphia.

The company revealed last week it has developed a new computer, the RW-330. The new unit has a memory capacity ranging from 4,000 to 100,000 words, which will enable it to fit into either a small or large plant.

BRIEFS . . .

Corp., up 25.1%, and Laurel Pipe Line Co., up 24.2%, had the largest increases. Two western lines, Yellowstone Pipe Line Co., off 21.2%, and Four Corners Pipe Line Co., down 19.9%, reported the biggest declines. Total revenue for all 72 was $184,942,381. They handled 1,226,512,132 bbl. in the first quarter of this year against 1,213,013,404 in the same period of 1960.

Cherokee Pipeline Co. will build a 12-mile line to move jet fuel from its main line at St. Charles, Mo., to Lambert Airport at St. Louis. The company also will construct a 40,000-bbl. jet fuel storage tank at the St. Charles juncture.

Canada's pipeline contractors will hold their 1962 meeting at Castle Harbor Hotel, Bermuda, February 14-17.

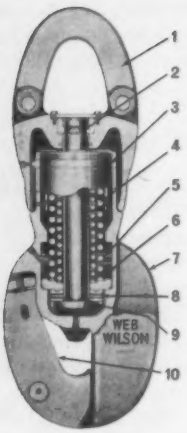
A 36-mile gathering system in the North Tioga area of North Dakota is being installed by Hunt Oil Co. Pipe sizes range from 3 in. to 18 in. Work was scheduled to begin last week. Headquarters of the contractor, Curran & Co., are in Minot.

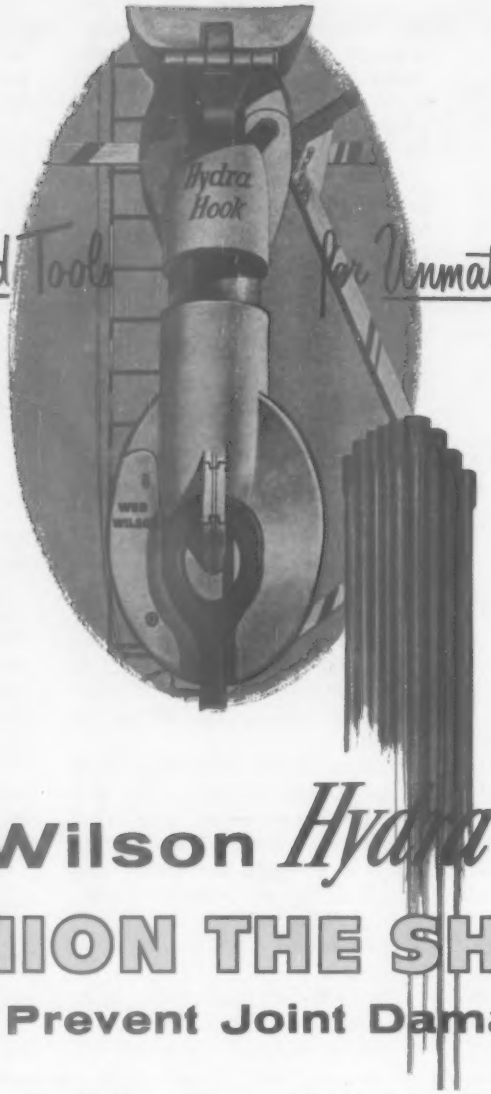
Canadians are now doing their own pipeline welding. A recent survey shows that just a shade over 1% of all the welders on four projects were Americans. Less than 3% of all pipeline construction personnel in Canada are U. S. citizens. Most of these are in supervisory or highly-skilled jobs. The Canadian contractors made the study after attention was focused on the large number of Americans holding such jobs.

A 55-mile products pipeline from Escanada, Mich., to the K. I. Sawyer Air Force Base near Sands will be built by National Pipe Line Co., an affiliate of F. H. McGraw & Co. The route will follow the Chicago & North Western Railway right-of-way. The line may later be extended to deliver products to the Marquette area. Total cost is $1,300,000. It is to be completed by mid-September.

A 14.4-mile 30-in. lateral will be laid in Spokane County, Wash., by H. C. Price Co. for El Paso Natural Gas. The line will run from the new Pacific Gas Transmission Co. line to the vicinity of Spokane.

"Matched Tools for Unmatched Performance"





Web Wilson *Hydra Hooks*

CUSHION THE SHOCK

to Prevent Joint Damage

Every time a joint is made up or broken out, you benefit from the simple, foolproof shock absorbing hydraulic action of the Web Wilson Hydra Hook that prevents damage to threads and shoulders. Another distinct advantage—Hydra Hook is the shortest on the market—the least expensive way to add feet and inches of working height.

Economical operation and simple servicing are assured by these features: (1) Can be unitized or direct connected to all leading traveling blocks • (2) No load carrying threads—solid shank carries load • (3) 8 locked positions (12 in 450 ton) prevent rotation • (4) Less than 10 working parts • (5) Transported without draining oil • (6) Major internal parts enclosed in oil bath • (7) Parts are magnaflux inspected • (8) Large, staggered roller bearing, in oil bath for free swiveling • (9) No seals in hydraulic reservoir to leak • (10) Latch *cannot* open with load applied.

The WW Hydra Hook is another of the tools in the Baash-Ross line of "*Matched* Tools for *Unmatched* Performance" to speed operations at reduced expense.

See a Baash-Ross representative or the Composite Catalog for additional details.

OUR 42d YEAR OF PROGRESS

JOY

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Cost Cutting With Computers

• Atlantic Refining expects to save a million dollars a year with its new computer center.

A NEW computer center opened by Atlantic Refining Co. marks another big step in a drive to cut costs, improve efficiency, and provide better information for management decisions.

As examples of what computer programs can do for the balance sheet, Atlantic expects to save $550,000 to $700,000 per year in gasoline blending operations and $500,000 to $600,000 per year in parts and materials handling at the Philadelphia refinery.

The center, housed in the Philadelphia refinery headquarters, has an IBM 7070 data-processing system, a 704 scientific computer, and a 1401 system. The equipment reequipment replaces an IBM 650 system.

The 7070, which reads and prints magnetic tapes at ultra-high speed, can quickly bring up to date large files of information. The 704, which can add or subtract more than 40,000 10-digit numbers per second, will be used mainly for research.

The 1401, operating as a satellite, will convert data to magnetic tape for processing on the other computers and then print their answers.

Inventory control . . . The computer program for refinery parts and materials supplies now includes 33,000 different warehouse items.

When the stock level of any item reaches a predetermined level, the program has a built-in reorder signal. It kicks out a requisition and in some cases a purchase order, including the vendor's name.

With such close supervision, working inventories can be kept much lower. A large volume of paperwork is eliminated, and personnel requirements are reduced.

Computer procedures control the billing and shipment of packaged products at the Philadelphia refinery with a big saving in warehouse space, handling, and preparation of orders. All products will be incorporated into the system later.

Refining applications . . . One of the first computer benefits derived in refining operations is in gasoline blending.

Estimates of savings of $1,500 to $2,000 daily are based on the ability to use all available components in the most profitable combination. Computer calculations provide day by day estimates of available components and economic comparisons of the various blending options.

Operating efficiencies of catalytic cracking, catalytic reforming, and wax units are being improved by studying indicated yields from models of these units. Eventually the entire 154,000-bbl. refinery will be simulated.

The cat cracker affords the best opportunity for more efficient operation by computer. Atlantic is in the first of three steps which will culminate in closed-shop control of this unit.

Crude evaluations . . . New crude-oil testing facilities, in combination with a computer program, will give Atlantic one of the most complete evaluations of any company on its biggest single manufacturing cost item.

In the new crude-oil examination building, almost a miniature refinery itself, every major operation except catalytic cracking can be duplicated. Here principal crude oils from U. S. and foreign sources are analyzed and their value to Atlantic is determined.

These evaluations are recorded on tape. When Atlantic receives an offer to buy a specific crude, the company needs to know in a hurry what it's worth. The computer can provide the answer in a few minutes.

These are but a few of the applications which will contribute tangibly to more profitable operations.

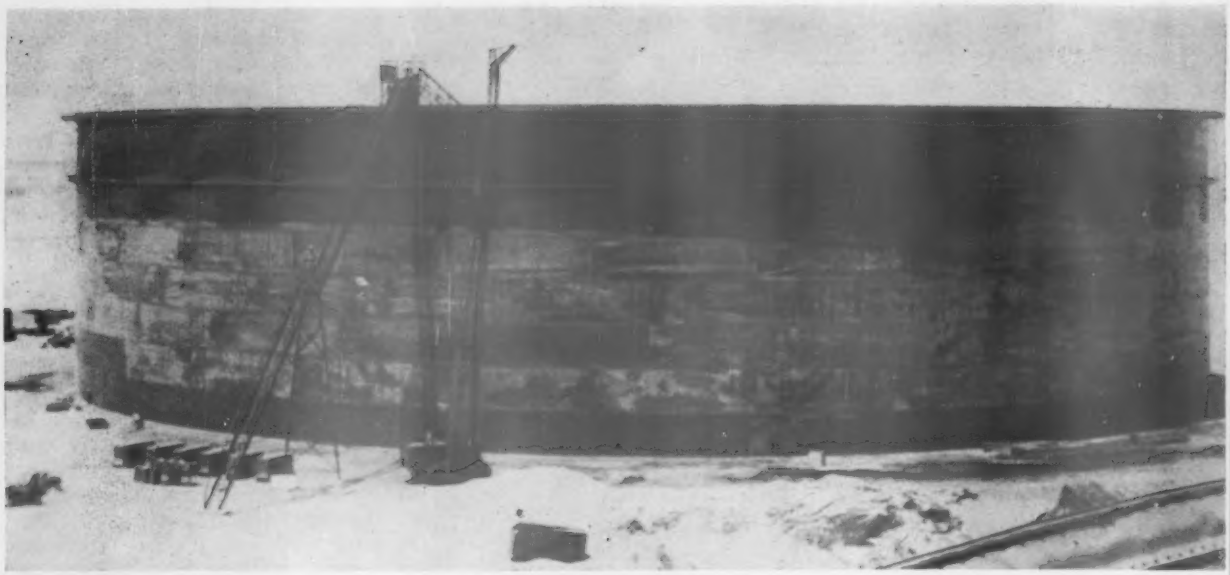
Contractors Who Build City Pipelines to Join Forces for Labor Talks

PIPELINE contractors who build distribution lines will form an organization this week with a prime purpose of negotiating agreements with labor unions.

More than 20 companies are expected to attend the meeting August 14-15 at the Muehlebach Hotel in Kansas City to organize the Distribution Pipeline Contractors Association. Also present will be national representatives of unions which hold labor contracts with pipeline contractors.

The new organization is separate from the Pipe Line Contractors Association, which is composed mainly of companies which build long-line transmission systems.

E. H. Clark, vice president of Engineering-Construction Co., Tulsa, heads the organizational activities for the new group.



WORLD'S BIGGEST TANK with storage capacity of 605,000 bbl. of crude is now handling Neutral Zone crude oil for Aminoil. It will speed up the loading of 85,000-ton supertankers which can carry 550,000 bbl. in one load.

Aminoil Launches Major Expansion Projec

TEN independents, who 13 years ago took the plunge into the Middle East, found oil, and fought for and won a market in high-powered international competition, today are carrying on a major expansion program to strengthen their foothold in the foreign oil business.

These partners in American Independent Oil Co. are making a major capital investment in facilities to handle their share of growing crude production in the Neutral Zone. Among these installations are:

... A 605,000-bbl.-capacity crude storage tank, the largest oil tank in the world.

... A new 100,000-bbl. refinery at Mena Abdullah.

... A new 32-mile 24-in. pipeline from Wafra oil field to Mena Abdullah tank terminal.

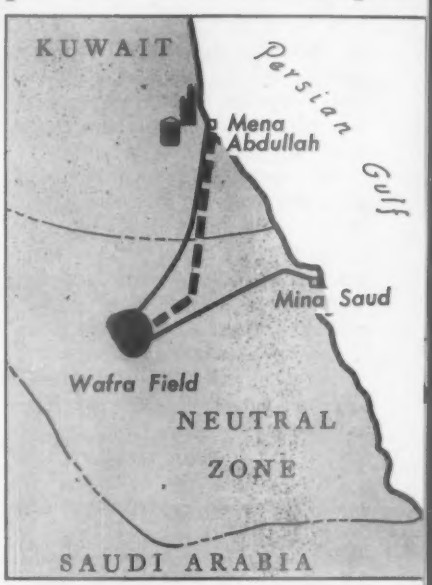
In addition to expansion of its physical assets, Aminoil has smoothed its way on the political front by signing a new supplemental concession contract with Kuwait, which has granted the company the onshore rights to its undivided half interest in the Neutral Zone. The new terms call for a 57-43 profit split, in favor of the government, based on actual realization, or a 50-50 split of profits based on posted prices, whichever is greater (OGJ, August 7, p. 99).

The other operator on the Neutral Zone mainland is Getty Oil, which holds rights to Saudi Arabia's undivided half interest in the zone. The two companies have steadily increased their output from 16,000 bbl. daily in 1954, the first year of commercial production, to a current 165,000 bbl. daily.

Each company moves its share of the crude in its own facilities. Aminoil's Mena Abdullah refinery and export terminal is in Kuwait proper, while Getty Oil operates a refinery and loading facilities at Mina Saud, on the Neutral Zone coast.

Gigantic tank . . . Aminoil's 605,000-bbl. tank, which is in operation, was built in order to accommodate 85,000-ton class tankers—which can carry 550,000 bbl. of oil. This saves time by eliminating the need to shift from one tank to another, and eliminates the need to stop and restart tank-farm pumps during loading.

The floating roof tank is 260 ft. in diameter and 64 ft. high. Eight steel rings, each 817 ft. in circumference and 8 ft. high, were used by Chicago Bridge, Ltd., a subsidiary of Chicago Bridge & Iron Co., to form the shell.



EXPANSION will include big-inch crude line, new refinery, and new storage facilities.

The first six rings were fabricated from T-1 steel, a special U. S. Steel high-strength alloy. The plates ranged from 1 in. thick at the bottom to ½ in. at the top. The type of carbon steel normally used in tank construction would have required plates too thick to meet API specifications to be used in this portion of the shell.

FOUNDATIONS are nearly completed for the heater section of the 100,000-bbl.-daily refinery being built as part of Aminoil's expansion in the Neutral Zone.

in Middle East

The top two sections, however, consist of A 131 carbon steel of ½ in. and ⅜ in. thickness. The joints throughout the shell were welded by an automatic process.

Construction will start soon on three new 300,000-bbl. storage tanks. These will be 185 ft. in diameter and 66 ft. high. A new Japanese steel, called Welcon-2H, is being used, with plate thickness ranging from 15/16 in. at the bottom to ⅜ in. at the top. The tanks are being built by a Japanese company, Mitsubishi Shoji Kaisha, Ltd., and will go into service in the summer of 1962.

Other projects . . . Aminoil is building a new 100,000-bbl. refinery which will go on stream early in 1962 and will burn sweet-gas fuel. Ralph M. Parsons Co. is the contractor. The new refinery, plus the existing 40,000-bbl. plant, will give the company processing capacity of 140,000 bbl. daily.

The new 24-in. buried pipeline to Mena Abdullah will be completed and in service in October. It is being laid by an all-Arab contracting firm, Emile Bustani's CAT Co.

Aminoil's existing offshore loading lines are considered adequate for the present. These include a 3-mile 24-in. and a 2-mile 16-in. loading line, along with a common 12-in. bunkering line.

Field development is continuing at Wafra, where Aminoil and Getty have a total of three rigs in operation. Many of the wells are on pump. There also are two rigs on wildcat and semiexploratory work.

The three principal owners of Aminoil are Phillips Petroleum, Signal Oil & Gas, and Ashland Oil & Refining. Their partners include Ralph K. Davies, J. S. Abercrombie, Crescent Corp., Sunray Mid-Continent Oil, Globe Oil & Refining, Lario Oil & Gas, and Pauley Petroleum.

Second Timor Test Has Show

A SHALLOW wildcat on the island of Timor has had an oil show but, like an earlier well, may not be completed because of mechanical problems.

A "live flow of oil" is reported in the 2 Matai, a 844-ft. wildcat. Mechanical problems have prevented an exact gage. If the operator is unable to complete the present hole, the rig will be skidded and another well drilled.

The 2 Matai is the followup of an earlier test that had a show, but could not be completed because of a strong flow of water (OGJ, May 8, p. 79). The holes are being drilled on the southern coast near the center of the island.

Sunset International Petroleum Corp., Beverly Hills, and Tradewinds Exploration, Inc., Denver, hold half interest in the venture. Timor Oil, Ltd., an Australian firm, holds the other half.

CREPS Seeks Sahara Permit

A FRENCH company with Royal Dutch-Shell participation has applied for a development concession in an area where it has found helium in connection with natural gas deep in the Sahara Desert.

CREPS, 35% owned by Shell, is seeking rights to develop In Salah gas field, about 600 miles south of Algiers in the South-Central French Sahara.

In Salah was one of the original finds in the Sahara, but was never commercially developed because of the great distance to tidewater.

Philippine Search Planned

A LOCAL Philippine company which brought in the island's first free-flowing oil well has made a joint exploration and development deal with Socony Mobil and Jersey Standard.

American Asiatic Oil Corp. has brought Mobil Philippines Exploration and Visayan Exploration, local subsidiaries set up by Mobil and Jersey, into a joint venture on about 671,800 acres of onshore and offshore rights. The new affiliates have been formed in anticipation of the split up of Stanvac.

American Asiatic, using two 1,000-ft. rigs, found oil in shallow wells on northern Cebu, where pressure zones have been encountered from the "grass roots" down in the Maya prospect of the Daan Bantayan region.

The company will continue to be operator in the vicinity of its discovery, and will undertake further exploration and eventual development in the area.

Mobil will serve as operator for other areas covered by the agreement, and it and Visayan will advance all exploration funds. American Asiatic will share equally costs of development on proven areas.

New Indonesian Oil Agency Welcomed

• Private operators believe they can come to terms with members of the newly formed board, which will supervise all petroleum affairs. Reason for optimism: The six board members are Indonesia's best-qualified oil men.

This is the third article in a three-part series on Indonesia's oil picture.

Paul Swain
International Editor

ALL OIL AFFAIRS, from exploration down to the sale of gasoline at the pump, will be supervised in the future by a new Indonesian Government body made up of the country's six most experienced men in oil.

Each of the six is now serving in one of the three government agencies which has some supervisory function over all operations in the country.

The new streamlined agency is Baden Pimpinan Umum Minjak, which translates roughly as the "general management body for petroleum." It is welcomed by the country's private oil industry, which hopes the new board will help simplify the day-to-day routine of the government as well as formulate a new definite framework for government-industry cooperation.

Up to now Indonesian oil affairs have been divided between three government agencies, some with vaguely defined functions and authority. The three are: Bappit Pusat, which had a rather vague role as supervisor of oil exploitation in the country; Biro Minjak Dan Gas Bumi (oil and gas bureau), which operates under the Ministry of Basic Industries headed by Chaerul Saleh, the No. 2 man in Sukarno's government; and Kantor Minjak (oil office), which was originally set up to take care of refining and marketing affairs.

Biro Minjak has been the promoter of state oil affairs and technical adviser to the government on exploration and production. Kantor Minjak has outgrown its refining-marketing role and become a much more prominent body dealing with foreign firms. In fact it has played a major part in the negotiations between government and companies over the past 6 months to try and arrive at new "working agreements."

The new BPU Minjak has drawn its personnel from all three. President of the new agency is Col. Ibnu Sutowo, president of the Indonesian state company Permina, which is now producing oil in the North Sumatra fields that were never returned to Royal Dutch-Shell after World War II.

Vice president is Col. Harjono, manager of Kantor Minjak. Members of the board are Basaruddin Nasution, manager of Biro Minjak and president of the new state-owned company Perusahaan Negara Pertambangan Minjak Indonesia (Pertamin); Dr. Sakidjan, an economist and assistant to Col. Harjono in Kantor Minjak; and politically prominent Effendi Saleh, the only member who does not now hold an oil office. Secretary general of BPU Minjak is Dr. E. Sanger, assistant manager of Biro Minjak.

The new deal . . . Industry officials now believe they will be able to come to terms with these government officials and work out agreements that will be acceptable to both sides for future oil operations.

"One year ago I wouldn't have given 1 cent for the oil industry's future here," one industry leader says. "Today I feel more confident we can cooperate, at least for a limited period of time."

This change in atmosphere can be credited to what the industry thinks is growing good will on the part of the government. Oil men believe this is based on the fact that the Indonesians have learned more about the oil industry, both at home and abroad, and are much more realistic with their new knowledge than they have ever been before.

One of the primary hitches so far is the life term of the new contracts under discussion. The Indonesians want to limit them to 20 years. The companies argue that they cannot afford to invest heavily on exploration programs with any hope of getting a profitable producing operation under way in such a limited time. Another bone of contention is repatriation of the foreign exchange earned and to be earned by oil exports. Because of its chronically short position in hard currencies, Indonesia wants to retain all the foreign exchange earned by oil in the country. The companies insist they must have a reasonable amount of hard-currency capital available to pay dividends and to buy vital supplies and equipment.

National companies . . . Indonesia now has as many state oil companies as private oil operators. The function of the newest one, Pertamin (formed by a government decree in February), has never been spelled out in so many words—but it presumably will be the national company which will make working

FOREIGN

Union Oil is drilling below 6,679 ft. at its East Cabawin No. 1, which is 4 miles east of its recent discovery in Queensland, Australia. This second test will go to 12,000 ft. The discovery, Cabawin 1, has been shut in since June 19 after producing at the rate of 60 bbl. daily for about a month.

Aramco's new drilling tender, towed to the Persian Gulf from New Orleans as replacement for the damaged "Queen Mary" barge, has gone into operation on Safaniya 39. The tender is used with a LeTourneau drilling platform.

Production of dimethyl terephthalate (DMT) is planned in the Netherlands by a new joint company formed by Amoco International, SA, wholly-owned subsidiary

contracts with private companies.

The oldest state company, P. T. Perushaan Minjak National (Permina), was set up by the government in February 1958 when Indonesia formally nationalized the fields north of Medan in North Sumatra. These old Royal Dutch-Shell fields have been produced on a limited basis by the army-led Permina since that time. Just this year Japanese drillers started reworking two of the old fields under a development contract signed with Permina. The Japanese are advancing Permina credits and technical assistance amounting to $52.3 million over a 10-year period.

The third national company, Pertambangan Minjak Indonesia (Permindo), has undergone an evolution from Royal Dutch-Shell to an Indonesian national company in two steps as the concession terms ran out in some fields. For a brief period it was owned half by the government and half by Shell. Now the entire ownership is vested in Indonesia, but Royal Dutch-Shell still operates the fields.

Permindo produces more than 27,000 bbl. daily from six fields in South Sumatra and one in Kalimantan (Borneo). The fields were discovered and operated for 40 years by the old Shell company, N.V. Nederlandsch-Indische Aarolie schappij (NIAM).

Hopes High in Peruvian Test

- **Mobil thinks it may hit oil beneath gas zone in new wildcat.**

MOBIL International is crossing its fingers in hopes that oil will be found below a high-pressure gas zone in its second wildcat in eastern Peru.

The company is coring ahead in its Aguaytia 1 after encountering a strong gas flow between 8,284-8,348 ft. A Schlumberger test on the section showed good resistivity.

A strong gas blow occurred during tests at the top of the Cushabatay sands between 8,326-48 ft., and high-pressure gas estimated at 3,000 psi. was found at 8,361 ft. On a drill-stem test at an unspecified depth, the tool contained 180 ft. of 58°-gravity condensate.

Aguaytia 1 is 5 miles northwest of the company's first well in Peru's Trans-Andes area. This was Zorillos 1, which was abandoned at 8,883 ft. It's 40 miles northwest of Texas Gulf Producing's Agua Caliente field, which produces about 2,400 bbl. daily from 14 shallow wells.

Mobil expected to spend as much as $1 million apiece on the Zorillos and Aguaytia wells, and it invested $3 million in predrilling exploration in the El Oriente region of Peru. It is operator in a joint venture with Peruvian, German, and Canadian interests.

These include Peruvian Oils and Minerals, Ltd., an Ontario-based company, and probably Cia. Peruana de Petroleo "El Oriente," which found Maquia oil field in the region. "El Oriente" is a Peruvian company.

Australian Test Dropped

A SECOND stratigraphic test on Mornington Island, Australia, has been completed by Delhi Australian & Santos, Ltd.

Basement rocks were encountered at 3,000 ft. and the hole has been plugged and abandoned.

Australia has approved three subsidies totaling $308,747 for seismic surveys in Queensland, in another development.

They are: Union Oil Development Corp., Dulacca area, $98,659; Associated Australian Oilfields N.L., Injune-Wallumbilla area, $100,818; Phillips Petroleum and Sunray, Jundah-Yaraka area, $109,270.

RIEFS . . .

of Indiana Standard. Amoco's Dutch partner, Algemene Kunstzijde Unie NV, manufacturers and markets Terlenka plyester fibers and yarns made from DMT. A plant at Delfzijl will employ an oxidation process using paraxylene as a base stock.

License to explore 90,000 sq. miles in central Bechuanaland has been awarded the Standard-Vacuum subsidiary operating in South Africa. The rights in the British protectorate were granted for 1 year, with a 1-year extension. Geological reconnaissance has started.

Capacity of the pipeline system from Saudi Arabia's Safaniya oil field has been upped 20,000 bbl. to 245,000 bbl. daily by installation of a 16-mile 30-32-in. loop to the 22-in. line to Khursaniyah pump station. When another 16 miles of loop is completed, capacity of the system will increase to 345,000 bbl. daily.

O. M. Kleemann, Ltd., British plastics firm, has been bought for $20 million by Mobil Chemical. Kleemann compounds and processes plastic materials in bulk.

An ammonia-urea plant is planned at Taiwan, Formosa, by Mobil Chemical, Allied Chemical, and Chinese Petroleum Corp. The Nationalist Chinese Government is studying the proposal. Planned production is 106,000 tons of ammonia and 100,000 tons of urea per year. Output will be sold to Taiwan Fertilizer Co.

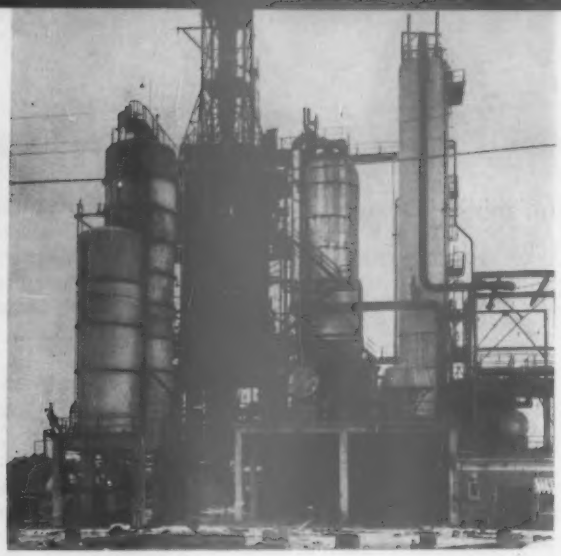
Nigerian crude exports may reach 60,000 bbl. daily by the end of this year as payout steps up for the $200 million investment made so far in the country by Shell-BP Petroleum Development.

Latest Japanese well completions in the Persian Gulf off the Neutral Zone test at a lower rate than earlier wells. Khafji 17 tests 2,880 bbl. daily, and No. 18 tests 5,230 bbl. daily. Arabian Oil's original wells were completed for around 6,000 bbl. a day.

Sarawak Shell Oilfields is abandoning an offshore wildcat drilled to about 8,000 ft. at Cochrane Shoals off the coast of British Borneo.

A new chemical firm has been organized in Italy by Gulf Oil. Italiana Resine Gulf, SPA., with headquarters at Sassari, Sardinia, will build a 70,000-ton per year phenol-acetone plant.

MOVING DAY FOR



1 CAT CRACKER was located at American Oil's Destrehan, La., refinery before move began. Moving project compared to new-unit construction in complexity.

THE FIRST Model IV fluid catalytic cracking unit ever built is back on stream at a new location. This time it is at Signal Oil & Gas Co.'s Houston division refinery on the Houston Ship Channel. Original location was American Oil Co.'s former refinery at Destrehan, La.

Signal moved not only the cat cracker but also a cooling tower, two 38 - ft. - diameter spheres, and four 70,000-lb. per hour boilers. A new gas plant replaces the original gas plant at Destrehan. Brown & Root, Inc., was the contractor.

The move is significant for several reasons. The major process vessels are among the largest vessels moved intact from one site to another. The move was feasible only because of water transportation between the two sites. Also, Signal gained a modern unit cheaper than building a new unit of the same size.

The new unit, which will be operated in parallel with Signal's other fluid cat cracker, was turned around as part of the move.

Unit Features

Startup of the cat cracker was smooth. Equilibrium catalyst was used. Precleaning of the process equipment provided for smooth operation during startup.

Since no hot spots have been found on the reactor and regenerator shells, it's apparent that the move did not damage the internal linings.

A new gas plant for 185-psi. operating pressure was built at Houston to replace the original 90-psi. gas plant. Integral with the new three-tower gas plant are treaters for naphtha, light gasoline, and gasoline. Original centrifugal gas compressor was revised to increase its discharge pressure.

Four 70,000-lb. per hour 400-psi. boilers were moved to Houston. More steam capacity was needed because the cat cracker's steam requirements are about 100,000 lb. per hour.

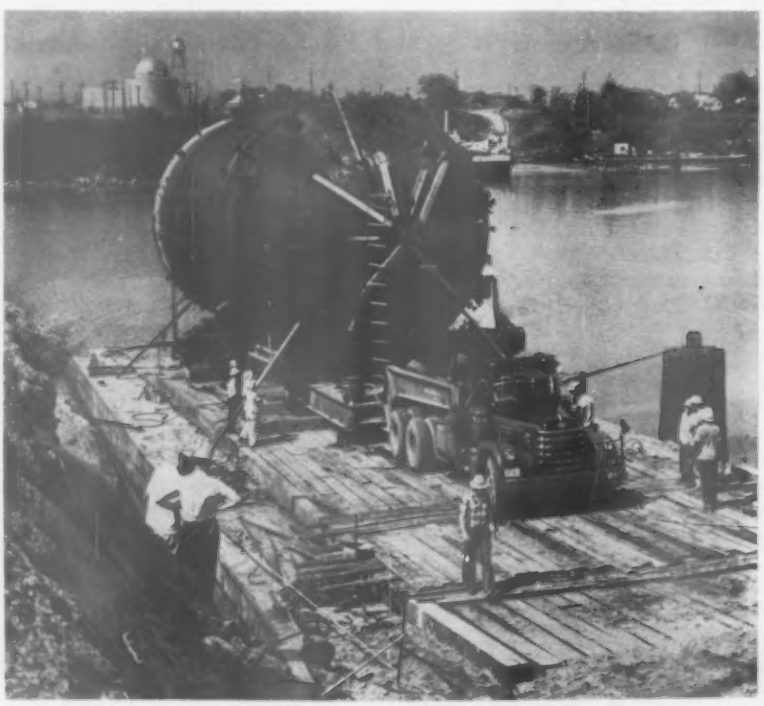
Two spheres 38 ft. in diameter were moved also. These were not placed on a barge but towed behind a tug for the voyage to Houston. All external ladders, supports, and pipe were removed before putting the spheres in the water. A boss was welded on each side of the sphere and a bridle connected the bosses. A bulldozer then rolled the spheres into the water and hawsers made them fast to the tug.

Vessel sizes. Reactor, 15 ft. 6 in. upper section, 9-ft. diameter lower section, 73 ft. 6 in. high, 260,000 lb. weight with internal lining. Regenerator, 23 ft. 2 in. in diameter, 43 ft. tall, 316,000 lb. weight with internal lining. Fractionator, 12 ft. in diameter, 96 ft. tall, 193,000 lb. weight with trays.

Move Takes Planning

Moving a large refinery unit from one site to another is not as

2 REGENERATOR is being readied for unloading from the barge which brought it to Signal's Houston Ship Channel site from Destrehan. Riggers are putting it on lowboys.



A CAT CRACKER

BY H. C. BOZEMAN
Gulf Coast Refining Editor

5 MOVE IS COMPLETE, all equipment is in place, and unit is ready for startup. A new gas plant (left) was built to serve the "new" cat cracker. Other Signal units are in background.

easy as it might appear. Foremost consideration is to keep the exact plot plan as the original installation. Otherwise the pipe will not fit. Reorientation of even one tower may cancel much of the savings of buying an existing unit.

A move requires closer coordination between engineering and field forces than when building a new unit. Also, more decisions need to be made at the job site.

Planning probably is the most important step and its thoroughness marks the job's final cost to be above or below estimates. First, the unit is divided into zones. Photographs are used to define the zones because of changes made since initial construction. Each zone is assigned a code number. All piping and equipment within each zone are systematically coded before beginning disassembly.

The code system makes reassembly easier. For this particular job Brown & Root assigned the same crew which had determined the coding system to supervise reassembly.

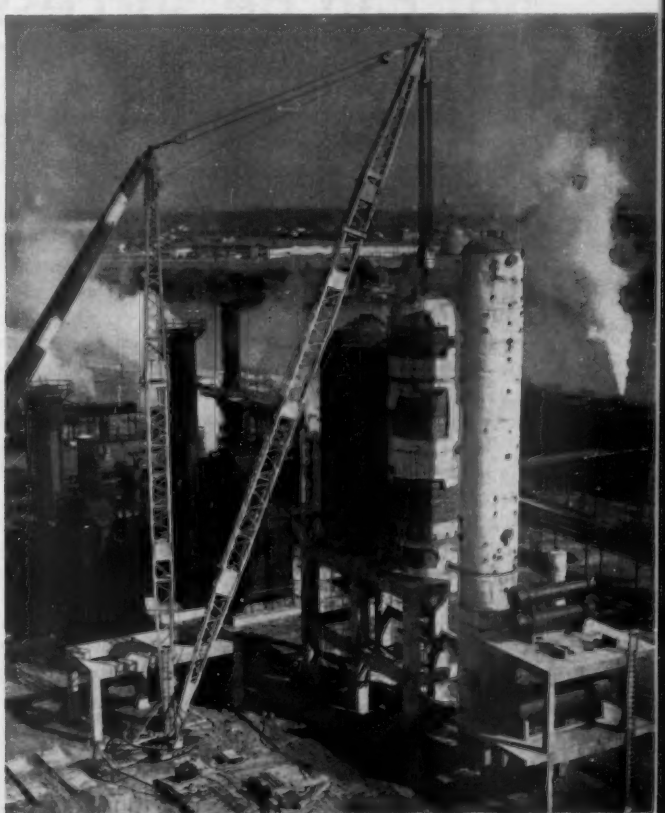
New foundations are constructed at the new site while disassembly is in progress.

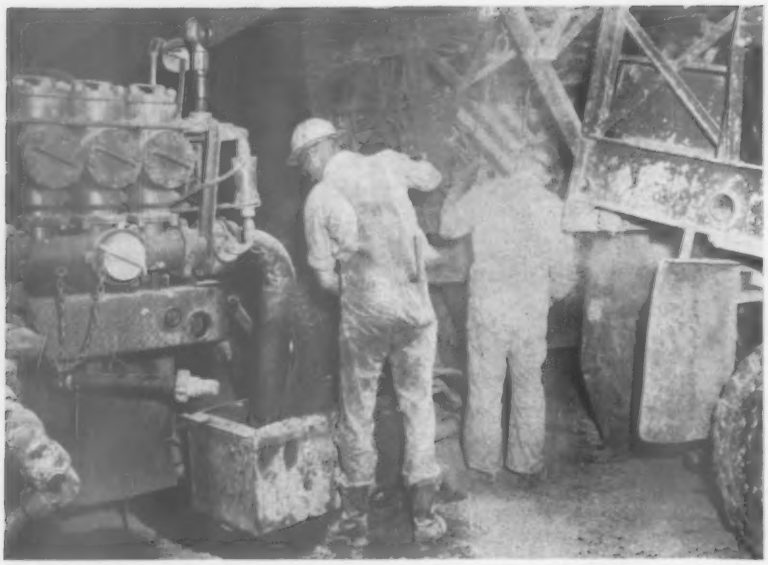
Preliminary inspection is made of equipment as it is disassembled. New parts are ordered to replace defective ones.

A complete inspection and repair job is done to all equipment before reinstallation. Some additional parts are replaced at this time. The unit's condition after the move compares to that after a complete turnaround.

3 STEAM GENERATOR, weighing 150 tons, is unloaded from barge by a giant barge-mounted crane. Other large vessels are on the barge in the background.

4 REACTOR is being positioned between the regenerator (left) and fractionator (right) by stiff-leg derrick. Catalyst hoppers go on superstructure behind derrick.





CEMENTING COMPOSITION is delivered to well location premixed. Here, cementing crews mix slurry being displaced into a Louisiana well more than 16,000 ft. deep and have bottom temperature of 315°

Slurries containing silica flour and new retarders have been used in more than 400 wells in different parts of the world. Thanks to their development it is believed that . . .

Wells up to 50,000 ft. deep and 700° hot can be successfully cemented

WHAT APPEARED only a decade ago to be formidable—if not prohibitive—obstacles to deep drilling have been removed by recent cement developments. In fact, there are now cementing materials which could be used in wells hotter and deeper than the industry can presently drill.

With the knowledge that already exists, there is every reason to believe that wells as deep as 50,000 ft. with temperatures up to 700° F. could be successfully cemented.

While many additives and cement compositions have been tested, the outstanding one developed to date is the ground-silica method. Cements using silica flour are frequently cheaper than pozzolan-type cements and require less weighting material to compensate for the density of the initial slurry.

Information for this article was supplied by Pennsylvania Glass Sand Corp. and Halliburton Co.

Silica-treated slurries have been used in more than 400 wells in many parts of the world with impressive results:

1. Added to standard Class E cement, ground silica can prevent retrogression of cement strength. The strength can be far in excess of that of neat cement. Ground silica also reduces permeability of the set cement.

2. Silica can be used, with proper planning, with all portland-type cements and all commonly used retarders. With a silica-treated slurry, pumping time can be long enough for cementing at extreme depths and under extreme temperatures. Still, waiting-on-cement time can be held to the minimum.

3. Under most conditions, minus-200-mesh ground silica in about a 30 to 40% ratio to cement is best. However, laboratory analysis is recommended in advance to tailor cement for each individual well when cementing below 12,000 ft.

Cements containing ground silica have proved versatile and effective in the field. They have been successful not only in primary cementing but also in squeeze cementing, cementing liners, and plugback operations.

Any company which plans drilling below 12,000 ft. with temperatures above 230° F. should certainly specify or investigate cement slurries containing ground silica.

Already a problem. Patents on the ground-silica process used in deep-well cementing are now held by Halliburton Co., of Duncan, Okla. A number of oil companies have also made extensive laboratory

and field tests of the material.

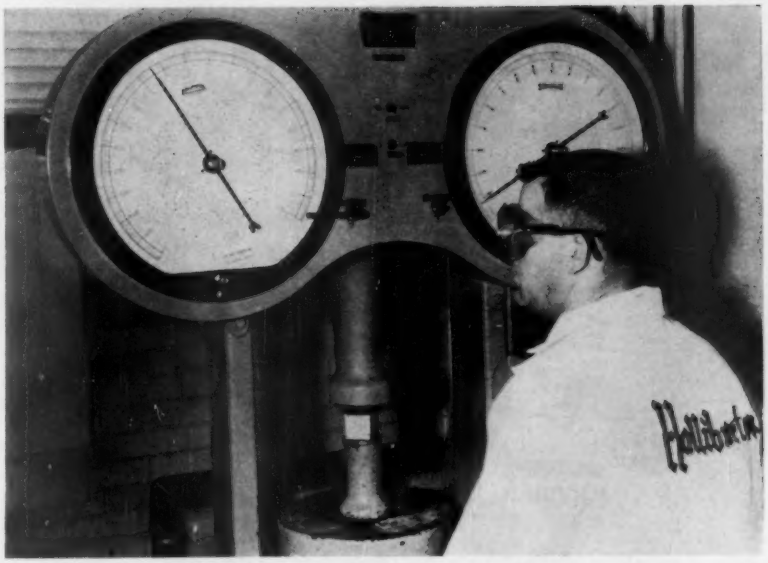
Halliburton's deep-well research program was accelerated in 1955 by the now-historic 22,570-ft. Richardson-Bass well, 1-L Humble-LLE, 35 miles southeast of New Orleans. This was the world's deepest at the time, and the well which generally proved the potential of commercial production from below 20,000 ft. After searching for a way to cement the well with some degree of certainty, a blend of pozzolan, hydrated lime, and set-control additives was selected for that well—but the serious probe for something better was set in motion.

Whereas most people figured compressive strength of cement improved with higher temperatures, laboratory investigations proved the opposite. Researchers found that greatest strength retrogression took place within 14 days after cementing under high-temperature conditions. Cement which had an indicated strength of 1,300 psi. in 24 hours had retrogressed to 65 psi. after 2 weeks under simulated deep-well conditions. A cement that had compressive strength of 4,500 to 5,000 psi. might have only half that within 14 days. Worse, the findings clearly indicated permeability is adversely affected by retrogression.

The result was an industry-wide search for cement that would not lose compressive strength under high temperature over a prolonged period of time, that could be retarded to provide adequate pumpability over periods of 4 hours or more, and that would be economically practicable. One main approach to this problem centered on ground silica as a promising additive to increase compressive strength of conventional slurry materials.

Lab tests verify. In 1957, Halliburton organized a series of tests of a large number of different cementing compositions under simulated deep-well conditions. In all, the company ran some 200 laboratory tests covering various temperatures up to 350° F. and spaced in time from 1 to 180 days. Both differential thermal analyses and X-ray defraction analyses were used to evaluate results.

What they proved essentially, was that cement without a ground-silica additive invariably exhibited strength retrogression under "hot hole" conditions. Compositions containing 30 to 40% ground silica did not retrogress, showed no increase in permeability, and actually increased in strength.



COMPRESSIVE STRENGTH of set cement, after curing under conditions of high temperature and high pressure, shows that slurries containing ground silica do not retrogress in strength as do other compositions. Moreover, the ground silica prevents rise in permeability.

Thermograms and X-ray charts showed why this is so. Cements exhibiting strength retrogression were found to contain hydration products—calcium hydroxide and dicalcium silicate alpha-hydrate. These products appeared together and sometimes singly, depending upon the temperature at which cementing compounds had cured and the length of time which they had been tested under deep-well conditions. Yet, in each case where either or both appeared, there was a corresponding loss of compressive strength.

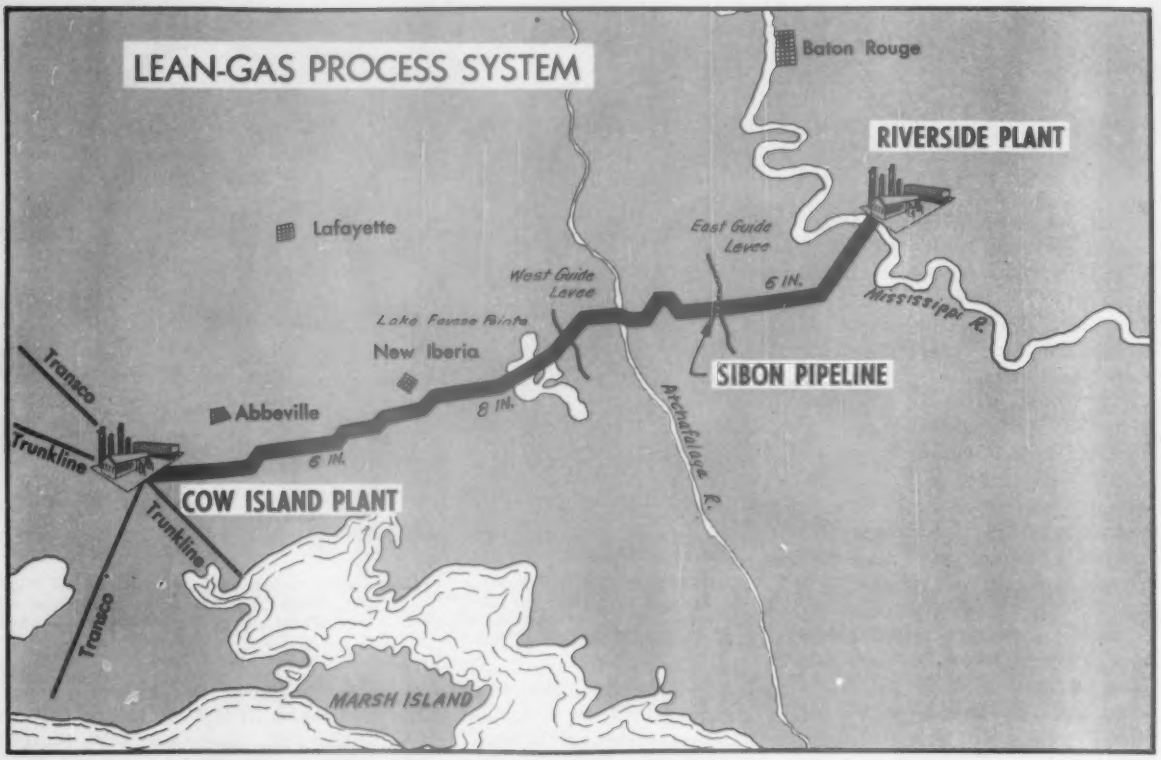
When silica was added in sufficient quantity, a portion of it reacted with the calcium hydroxide to form dicalcium silicate alpha-hydrate. The remaining silica reacted with the alpha-hydrates to form what is known as the tobermorite phase (calcium meta silicate hydrate and calcium silicate hydrate). Correlation of these test data on reaction products with compressive strength and permeability data indicated that the tobermorite group of calcium silica hydrates was a better cementing phase than the dicalcium silicate alpha-hydrate.

Technical language aside, these were the significant conclusions drawn from the following tests:

When 30 to 40% ground silica is added to conventional API Class E cement (usually at a ratio of about 28.2 lb. of ground silica for each 94-lb. sack of cement), the ground silica stops retrogression and reduces permeability in deep wells where temperatures above 230° "break down" conventional cements. In fact, the temperatures which start retrogression in portland cement set up a molecular action in ground silica which actually increases the compressive strength of hardened cement.

A uniform minus-200-mesh ground silica mined and processed by Pennsylvania Glass Sand Corp., Mill Creek, Okla., is normally used.

Field results good. Following is a typical report on a liner job performed on the Louisiana coast. With a 16,000-ft. hole and a static temperature of 315°, the operator requested 4 hours of pumpability. The slurry prescribed weighed 18 lb. per gal. It included 35% 200-mesh ground silica and HR-12 retarder (0.15%) in Texcor cement. Curing at 315° under 3,000 psi. of pressure, this mixture had set in 12 hours. After 18 hours its compressive strength tested 3,000 psi. and in 24 hours this had climbed to 4,500 psi. In 36 hours, the compressive strength was above 5,000 psi.



Gas liquids are extracted at Cow Island and raw make is pumped through the Sibon pipeline to the Riverside plant for fraction to overcome problems of . . .

Lean-gas processing and marketing in South Louisiana

BY H. C. BOZEMAN
Gulf Coast Refining Editor

TWO PROBLEMS caused considerable trouble when Goliad-Union set out to build a new gas-liquids-plant system in Louisiana (OGJ, Dec. 12, 1960, p. 85).

The first problem was how to make gas measurements when shrinkage would be less than meter tolerances. Also the exports had to find where the best locations would be for extraction and fractionation.

Goliad-Union came up with these answers:

They decided to make direct measurement of residue gas, plant fuel, products, and vented vapors, and design the extraction plant with a low-temperature-absorption process and a high thermal efficiency.

In addition, they decided to orient the plant to the market; that is, locate extraction near the gas fields and fractionation near the markets, and connect the two with a line.

The three parts of the plant system are: a 450-M.M.c.f.d. extraction plant at Cow Island in Vermilion Parish, Louisiana, the Riverside fractionation plant near Geismar, La., and the 87-mile Sibon pipeline connecting the two plants.

The extraction plant currently is being expanded to a capacity of 600 M.M.c.f.d.

Transmission systems of Transcontinental Pipe Line Corp. and Trunkline Gas Co. meet at Cow Island extraction plant and furnish the feed gas.

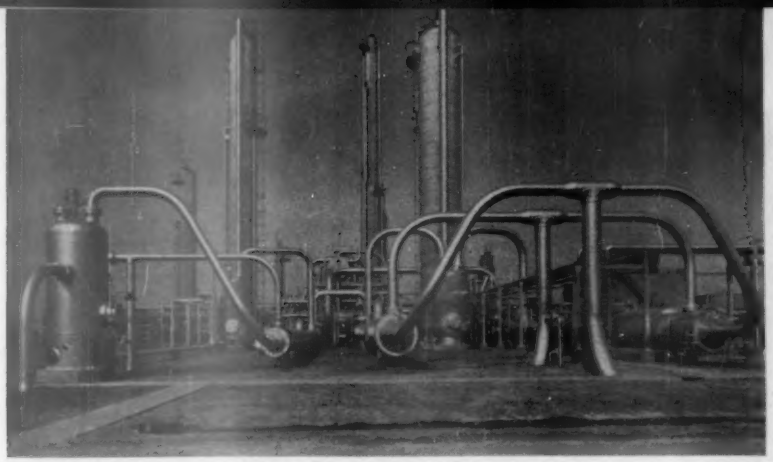
Goliad Corp. and Union Oil Co. of California are equal partners in the $13 million system. Goliad is the operator. Sibon Pipeline Co., a Goliad subsidiary, operates the line.

System Orientation

Processing posed problems because of gas-field location and gas leanness.

The producer in many gas-field areas processes gas before delivery to the pipeline. But in Southwest and offshore Louisiana, gas fields usually are unsuitable plant sites.

One way for producers to receive benefit from gas liquids is to retain processing rights after metering the gas to the pipeline. Then the



LONG SWEEPING BENDS in the inlet and outlet piping minimize pressure drop at Cow Island extraction plant. Gas-to-gas exchangers, over 90 ft. long (foreground) contain two sections of 40-ft. heat-exchanger tubes.

gas can be processed where there is a suitable site.

Union Oil in conjunction with some other leading producers negotiated the right to process their gas in a commingled state in the Transco and Trunkline systems at Cow Island Junction. When such rights are exercised, the pipeline is to be reimbursed for all losses in gas volume due to processing.

However, overall processing loss was expected to be only slightly over 3% of gross gas volume. Such a differential is less than the sum of tolerances of two meters in series. The solution was to make direct measurement of losses and to use a low temperature oil absorption process.

Extraction-plant location and process requirements were now resolved. The next problem was to market the products.

The only other large market of gas liquids other than Lake Charles in Louisiana is between New Orleans and Baton Rouge. Here, existing plants furnish a current market which has growth potentials as more process plants are built.

Another advantage of a Mississippi River location is access for river and rail shipment to other parts of the country. Rail shipments with a point of origin on the east side of the river can realize a tariff savings up to ¾ cent per gallon. A site near Geismer, La., met these criteria.

Cow Island Plant

The plant is sized initially to process 450 M.M.c.f.d. of gas and recover 20% to 25% of the ethane, 90% of the propane, and 100% of the butanes and heavier. Gas liquids content in the inlet stream is about 0.6 gal per M.c.f. Recovery is done by chilling the inlet gas to −40° F. and contacting it with 100 mol. wt. lean oil chilled previously to −45° F. The plant was designed and built by Fluor Corp., Ltd.

Measurement method. Usual procedures of measuring gas volumes in and out could not be used because of gas leanness. Meter tolerances could result in a gain in volume or twice the loss as the gas went through the plant.

A new measuring system had to be designed. All outlet streams are measured; thus, the sum must equal that entering. Residue gas is measured and all losses are measured which are: plánt fuel, gas liquid product, and vented vapors.

Also, flash vapors are returned to each pipeline.

Residue gas is metered at the outlet of individual aborbers for the Transco and Trunkline pipelines. The meters are precise multiple-tube meter runs and include both upstream and downstream doughnut loop headers. Also as part of the meter system are a temperature recorder, temperature indicator, gravitometer, and calorimeter.

Plant fuel comes from three sources and each is metered before entering the fuel-gas header. Plant fuel comes from the rich-oil demethanizer, emergency fuel from residue gas, and low-pressure fuel from the glycol and sponge-oil system.

Gas-liquid product or raw make is measured by a temperature-compensated positive-displacement meter. Calibration can be checked without interrupting flow by a bi-directional positive-displacement prover. Goliad says this system is not only quicker but more accurate than the conventional proving tank. The meter paces a continuous raw-make sampler.

The vent system must handle three different conditions. These are: (1) Short-duration high-flow rate from relief valves on large vessels; (2) long-duration low-flow rate from leaking relief valves on small vessels; and (3) short-duration medium-flow rate from relief valves on small vessels. The source of greatest annual loss is expected from long-duration low flows and is where the greatest measurement precision is used.

Short-duration high-flow rates which happen only infrequently, are computed as the product of the valve manufacturer's maximum rated flow times the flow duration as determined by the vessel's pressure recorder.

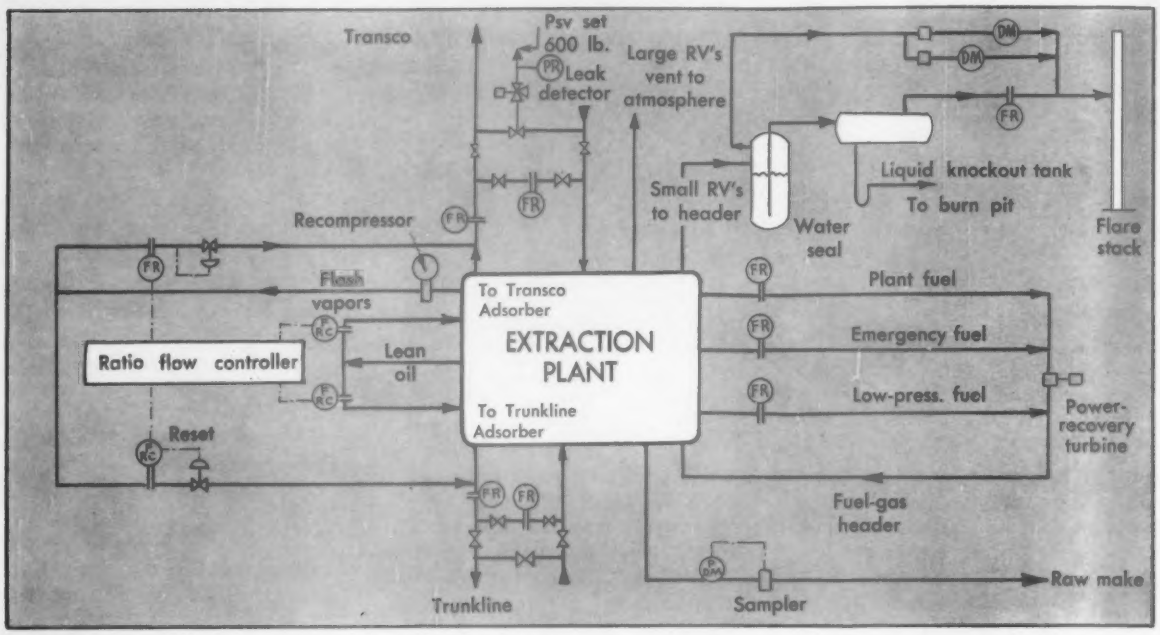
These relief valves which exhaust directly to the atmosphere are on the Transco absorber, Trunkline absorber, rich-oil demethanizer, presaturator lean-oil separator, high-pressure fractionator, and dehexanizer.

All relief valves from the smaller vessels are tied into a common header to the flare stack. Long-duration low flows are measured by positive-displacement diaphragm-type meters which are protected against excess flow by upstream flow chokes.

When flow exceeds choke capacity, such as a relief-valve popping, a water seal is broken and the gas passes directly through an orifice meter to the flare stack. The water seal automatically is reestablished when the valve reseats and low-flow conditions are restored.

Excess flash vapors are compressed and returned to each residue-gas stream by the ratio-flow controller. These vapors come from the high-pressure rich-oil flash tank and those vapors not used for plant fuel from the rich-oil demethanizer.

The ratio-flow controller measures the lean-oil flow to each absorber to establish a flow ratio. The vapors are returned to the pipelines in direct proportion to this ratio. The controller sets a flow rate on the Trunkline FRC and the remain-



MEASUREMENT of all outlet streams at the Cow Island plant is necessary to compute shrinkage. Even the flash vapors are returned to the residue-gas lines in proportion to lean-oil flow to the absorbers.

ing vapors go to Transco through a back-pressure regulator.

The controller is designed to split the recompressor gas flow on the basis of lean-oil flow split to the absorbers. The ratio of the split in gas flow is biased manually to account for differences in the absorption efficiencies of the lean oil as a result of different absorber pressures and temperatures.

Extraction. Separate absorbers which are identical except for size process Transco and Trunkline gas. Gas enters the plant through an inlet scrubber. It then flows progressively through the gas-to-gas exchanger, gas chiller, glycol separator, absorber, residue scrubber, gas-to-gas exchanger, and returns to the pipeline.

Gas enters the absorber at −40° F. and contacts presaturated lean oil of 100 mol. wt. A propane refrigeration system supplies refrigeration. Glycol injection prevents hydrate formation in the gas-to-gas exchangers and gas chiller.

Sponge oil to 140 mol. wt. circulates over the top few trays of the absorber which cuts lean-oil loss in the residue gas. Sponge oil has its own recovery system which also serves as the lean-oil reclaimer.

Rich-oil streams from the absorbers combine and flow to the high and low-pressure rich-oil flash tanks before entering the rich-oil demethanizer.

Lean oil is presaturated by rich-oil demethanizer overhead vapors before being pumped to the absorbers.

Lean-oil presaturation eliminates recompressing part of the methane and ethane vapors absorbed in the oil. Also, heat of solution is generated outside the absorber where it can be removed by heat exchange.

Gas from the presaturator is used for plant fuel. The excess is compressed with high-pressure rich-oil flash vapors and returned by ratio control to the residue-gas streams.

The top or reabsorber section of the rich-oil demethanizer has two side-stream chillers and reflux is −45° F. lean oil. Rich oil from the rich-oil demethanizer flows to the high-pressure fractionator. Part of the lighter material is flashed overhead directly to the raw make tank.

Bottoms go to the dehexanizer (rich-oil still) where products extracted from the gas are stripped from the rich oil. Part of the dehexanizer overhead vapors are condensed. Uncondensed vapors are compressed to raw make tank pressure and recombined with dehexanizer overhead liquid and high-pressure fractionator overhead vapor.

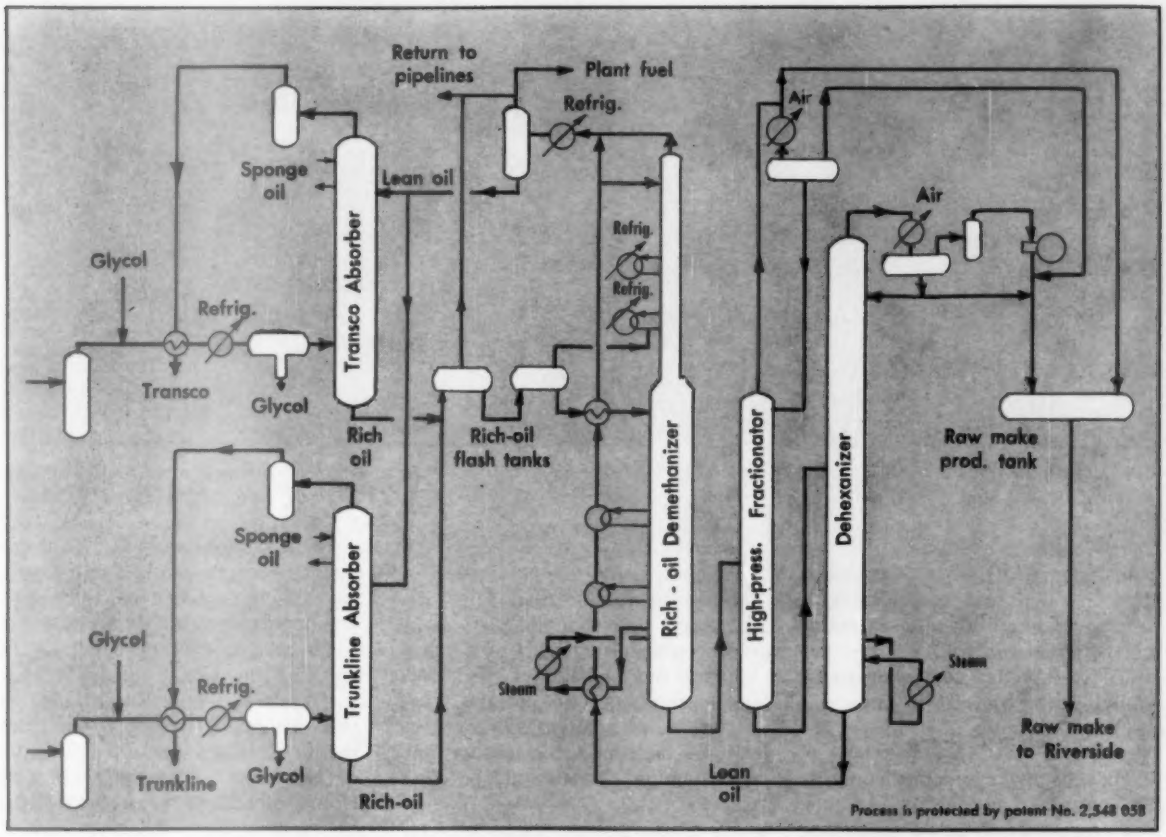
Raw make is pumped through the 87-mile Sibon Pipeline to the Riverside plant for fractionation.

Plant features. Propane refrigeration compressor drives are two 3,916-b.hp., 6,450-r.p.m. condensing steam turbines. The plant's steam demand of 128,000 lb. per hour is supplied by three 55,000-lb. per hour package steam boilers. Two 600-kw. topping steam turbines drive electric generators, one running and one standby. Exhaust steam, 270-psig., supplies process heat and steam for the lean-oil pumps' condensing turbines.

Also, hydraulic turbines supply about 25% of the horsepower requirements for driving the lean-oil pumps. The hydraulic turbines recover power from the pressure reductions between the absorbers and high-pressure rich-oil flash tank, and rich-oil demethanizer and high-pressure fractionator.

Instrumentation. The extraction plant has two control rooms, one for process and another for boiler utilities. Only two operators are required per shift. Both control rooms are equipped with miniature pneumatic instruments and strip-chart-recorder controllers.

A process chromatograph is on order that will automatically monitor the methane - ethane - propane



LOW-TEMPERATURE ABSORBERS wring valuable gas liquids from Transco and Trunkline lean-gas streams at Cow Island extraction plant. Extracted products are stripped from the rich oil and pumped to the Riverside plant for fractionation.

content of vapors from the rich-oil demethanizer overhead, Trunkline residue gas, and Transco residue gas. Each analysis will take about 6 minutes and a complete cycle about 20 minutes.

Boilers are operated from a graphic control panel. The graphic part is painted instead of the usual metal-and-plastic strips. Goliad says the panel was very helpful in training new operators.

Riverside Plant

The fractionation plant is on the east side of the Mississippi River near Geismar, La. It can produce ethane - propane mixture, commercial propane, isobutane, normal butane, and 12-lb. natural gasoline.

Fractionation - plant design was based on an ultimate capacity of 30,000 bbl. daily of propane and heavier feed stocks. Since initial throughput would be less, Goliad did not install certain duplicate equipment not needed now. The plant was engineered and built by Mid-Valley, Inc.

Process flow. Raw make from the Sibon pipeline goes into the raw make surge tank. Raw make is pumped through preheat exchangers to the deethanizer tower. An ethane-propane mixture is taken overhead and partially condensed.

Goliad selected the ethane-propane mixture for two reasons. First, there was a market for the mixture. Second, the mixture costs less to make than to make ethane and then to blend in propane. Further, pure ethane requires a refrigerated overhead system but water cooling will produce the mixture.

Excess ethane - propane mixture not sold via pipeline goes to the fuel-gas fractionator. Ethane is taken overhead for plant fuel.

Deethanizer bottoms are fed to the depropanizer and propane is taken overhead. Depropanizer bottoms feed the debutanizer where natural gasoline is bottoms product.

Debutanizer overhead is sent to the deisobutanizer tower. Isobutane is recovered overhead, and normal butane from the bottom.

Instrumentation. The Riverside plant has one central control room manned by one operator per shift. The control room is equipped with miniature strip chart recorders and recorder controllers. Also, the control room has an alarm panel and a push-button 48-point pyrometer to monitor critical temperatures.

A process chromatograph is now analyzing four product streams: deethanizer overhead, depropanizer overhead, and deisobutanizer overhead and bottoms. The instrument will automatically sample and analyze these streams. Each analysis will require about 5 minutes and printout is in per cent composition.

Differential vapor pressure controls the deisobutanizer reflux rate. The controller, mounted in the tower's top section, is actually a sensitive temperature controller with a built-in correction for tower-pressure changes. Natural gasoline with a vapor pressure as low as 12 lb. R.v.p. can be produced.

A pH recorder - controller and specific-conductivity recorder-con-

RIVERSIDE PLANT has a hot-oil system that supplies all process heat. Distillation towers separate raw make from the Cow Island plant into an ethane-propane mixture, propane, isobutane, normal butane, and 12-lb. R.v.p. natural gasoline.

troller assure high-quality cooling water with a minimum of operator attention. The pH controller sets sulfuric acid-addition rate to maintain a pH of 6.8 to 7.2. The specific-conductivity controller sets cooling-water blowdown rate.

Sibon Pipeline

The raw make pipeline connects the Cow Island and Riverside plants. The pipeline is about 87 miles long and has two 6-in.-diameter sections totaling 58½ miles and an 8-in. section across the Atchafalaya basin.

Construction methods of the land and marsh sections are notable.

Routing the pipeline across the Atchafalaya basin saved right-of-way acquisition time and cost and shortened total line length.

The pipeline cost about $4 million and the Atchafalaya basin portion cost about 65% of the total.

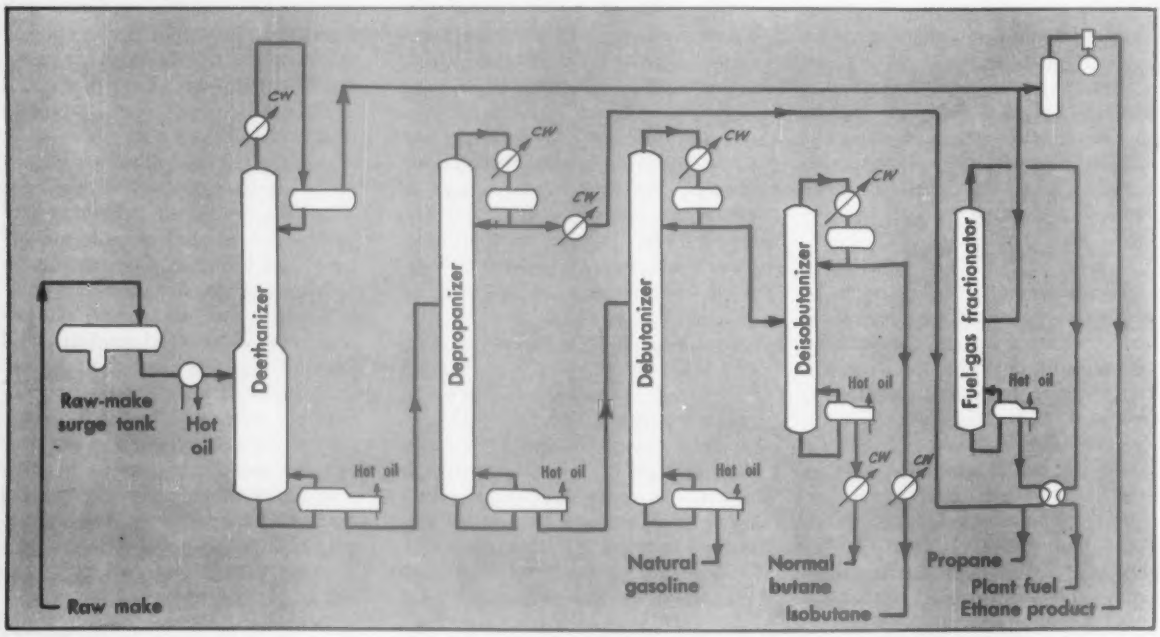
Pipeline completion was governed only by the time the extraction and fractionation plants would be completed.

A single pump station at Cow Island meets initial capacity. Two intermediate pump-station sites have been purchased at points of line-diameter changes when more capacity is needed.

Land sections were laid to minimize interference with agriculture. The timing problem was to do laying operations after harvesting the sugar cane and before beginning to cultivate the rice.

The land sections were laid in two sections. The first was from the Cow Island plant to just east of New Iberia and the other was from Atchafalaya's east guide levee to the Mississippi River.

Laying operations began in February 1960 at Cow Island and proceeded 38½ miles to near New Iberia arriving there in mid-April. The pipeline spread then leap-



RAW MAKE is separated into components for marketing at the Riverside plant through a cascade fractionation flow scheme.

frogged to the Mississippi River and laid 20 miles westward to the Atchafalaya basin guide levee. Dryland construction was finished in June 1960.

A 4-in.-diameter ethane sales line parallels the raw make line for 14 miles west of the Mississippi River and goes to Dow Chemical Co. at Plaquemine, La.

Laying operations were conventional from Cow Island to New Iberia. However, laying was complicated by canals and other pipelines. The pipe had standard yard coating with coal-tar enamel and glass-fiber outer wrap.

On the section east of the Atchafalaya guide levee only one landowner has agriculture. The remainder is heavily timbered. A backhoe did the ditching and pipe was pushed into the ditch. Several miles of pipe in this 20-mile section are concrete-coated.

Atchafalaya basin crossing was laid by marine methods from a lay barge in a flotation canal. Construction scheduling was critical because of the short time that the basin's water conditions were favorable for marine methods.

The favorable time is when the basin's water level is falling. This minimizes the effect of current on the sides of the lay barges. Then, if marine methods are to be used, laying operations must be done quickly and finished before reaching low water which would leave the lay barges high and dry.

Historically, this time is between July 15 and August 15.

A 42-ft.-wide flotation canal, 19½ miles between guide levees, was dredged in 40 days by eight floating dredges. Over 3 million cubic yards of material was moved. The smallest dredge had a 4-cu.-yd. dipper.

The concrete-coated pipe was laid in a small trench in the flotation canal. The trench was dredged to −4 ft. mean Gulf of Mexico level.

The lay barges totaling more than 400 ft. in length began laying operations on the night of July 25, 1960, at the eastern guide levee. The west guide levee was reached on August 4, 9 days later. Two rivers in the basin were crossed en route.

The daily advance was two hundred seventy-eight 55-ft. joints and during the peak day 371 joints were completed.

WELDING, inspection, and coating operations complete, the pipe moves off the barge and into a trench dredged along the side of the flotation canal.

The lay barge had five stations: Stringer-bead, hot-pass welds, cap welds, X-ray, and joint wrapping with coal tar.

The pipe is yard-coated concrete pipe with 140-lb. per cubic foot concrete. The thickness and weight of the concrete and pipe are greater at river crossings.

A section about a mile east of the east guide levee was laid by the push technique. On the west side of the basin the line was pulled across Lake Fausse Pointe to connect with the end of the 6-in. line near New Iberia.

Mississippi River crossing has three 6-in. concrete-coated lines whose services are the raw make line, ethane-sales line, and a spare. Each crossing is about 4,400 ft. long. Each line was pulled across and assembled joint by joint in about 10 hours from the west bank.

Trenches were dredged into the river bank about 200 ft. on the east bank and 600 ft. on the west bank. The crossings are free-stress crossings which follow the contour of the river bottom. High-density concrete overcomes the buoyancy and lift due to water velocity across spans which might develop from scours in the river bottom.

A clay plug was encountered in about 60-90 ft. of water near the east shore. Divers descended to the spot and jetted out the plug, permitting the pipe to be lowered into the ditch.

Testing and other features. The line was tested hydrostatically. Block valves are installed at about 9-mile intervals. All welds on the Mississippi River and Atchafalaya basin crossings were X-rayed. About 5% of the land welds were X-rayed.

The 6⅝-in. o.d. sections have a 1,250-psig. working pressure. The 8⅝-in. o.d. by ¼-in. wall section across the Atchafalaya basin has a 1,425-psig. working pressure. All pipe is X-42.

Aerial survey-ownership maps were used to draw prototype alignment maps for survey parties and right-of-way acquisition. The line was routed parallel to field boundaries whenever possible.

Short-wave radio connects Cow Island and Riverside. Leased lines connect the two plants with the Houston main office.

Cathodic protection will be installed when the ground consolidates.

Contractors. Ford, Bacon & Davis Construction Corp. built the 6-in. land sections. Brown & Root, Inc., laid the 8-in. line across the Atchafalaya basin. Houston Contracting Co. made the Mississippi River crossing.

Processing notes

Gulf's new lube-oil hydrofinishing makes debut

HYDROFINISHING of lube oils takes another step forward with construction of the first "Gulfinishing" unit at Gulf Oil Corp.'s Port Arthur, Tex., refinery.

The process is a joint development of Gulf Research & Development Co., a Gulf Oil subsidiary, and Gulf Oil. Bechtel Corp. was the prime contractor.

Completed this summer, the Port Arthur unit consists of twin 6,500-bbl.-daily process trains. The twin trains increase operating flexibility and reduce maintenance costs. The unit replaces clay contacting, percolation, filtering, and acid treating. It can process 12 different feed stocks that are available from current operations.

Gulf plans runs of 5 days minimum between feed-stock changes. A bench-size unit in the refinery's laboratory will operate in conjunction with the full-size unit to coordinate operations and quality control.

Advantages of lube-oil hydrofinishing are:

- Removes sulfur, unsaturated hydrocarbons, nitrogen compounds, naphthenic acids, and gum-forming materials to make a more stable lube oil.
- More economic processing costs than present conventional processes.
- Yields are 4 to 20% higher than clay contacting or acid treating.

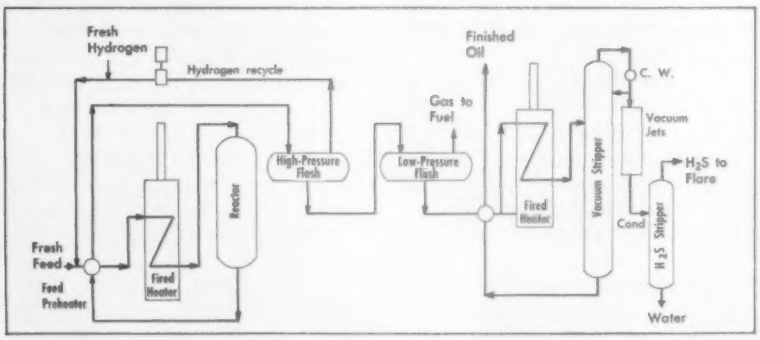
Process

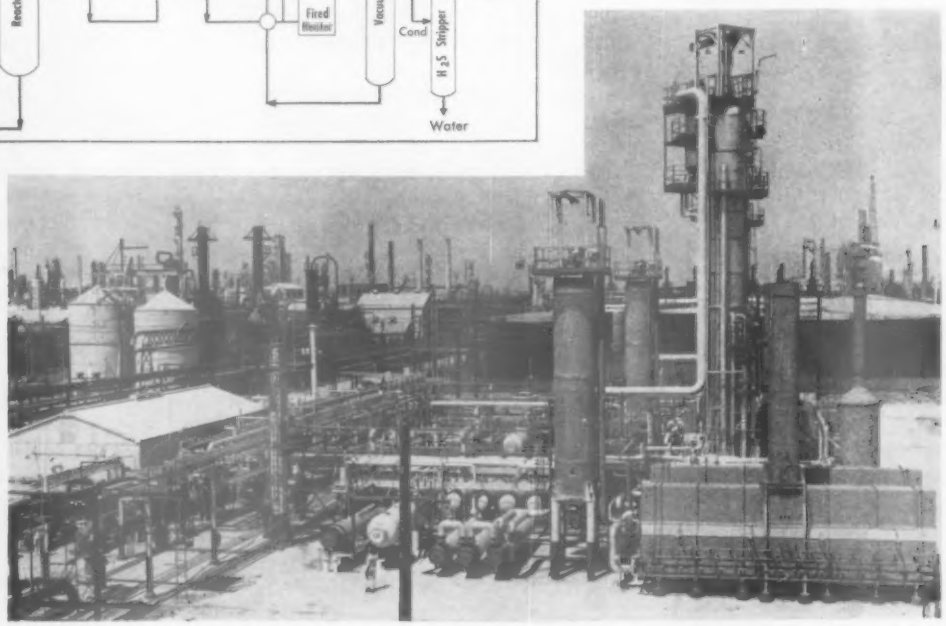
Lube oils in liquid phase, but at elevated temperatures and pressures, with hydrogen gas contact a Gulf-developed solid catalyst in a once-through process. Vacuum stripping completes the processing steps.

Reaction. Lube-oil feed stocks and recycle hydrogen are mixed at elevated pressures and fed through a preheat exchanger and fired heater to the top of the reactor. Close control of fired heater temperature avoids charring the lube oil. Reaction occurs in a downflow reactor over a solid catalyst.

Reactor effluent preheats the feed and then goes to a high-pressure flash drum. Flashed hydrogen is recycled. Liquid phase from the high-pressure flash flows to the low-pressure flash for final removal of dissolved gases.

Stripping. Liquid phase from low-pressure flash is fed through a preheat exchanger and fired heater to the top of the vacuum stripping tower for steam stripping. Finished lube oil collects at the bottom of the stripper tower and is pumped to tanks for blending and packaging operations.





GULFINISHING process is designed to process wide variety of lube-oil stocks on once-through basis. Twin-train unit at right is in Gulf's Port Arthur, Tex., refinery. One train is in the foreground and the other is behind. Reactor is at left of the heaters.

DATA-PROCESSING system, computer, and attendant facilities comprise the equipment in Atlantic Refining's computer center in Philadelphia.

Atlantic's new computer center will perform several chores

A NEW computer center has been opened at Atlantic Refining Co.'s refinery headquarters in Philadelphia. It will contain a transistorized IBM 7070 data-processing system, an IBM 704 scientific computer, and an IBM 1401 system.

Equipment. The 7070 computer has the ability to read and print magnetic tapes at ultrahigh speed, thus providing tremendous capacity to update large files of data in a few minutes.

The 704 computer system, to be used mainly for research, is capable of solving problems in 30 seconds that would take 15 years with pencil and paper. It can add or subtract over 40,000 ten-digit numbers in 1 second.

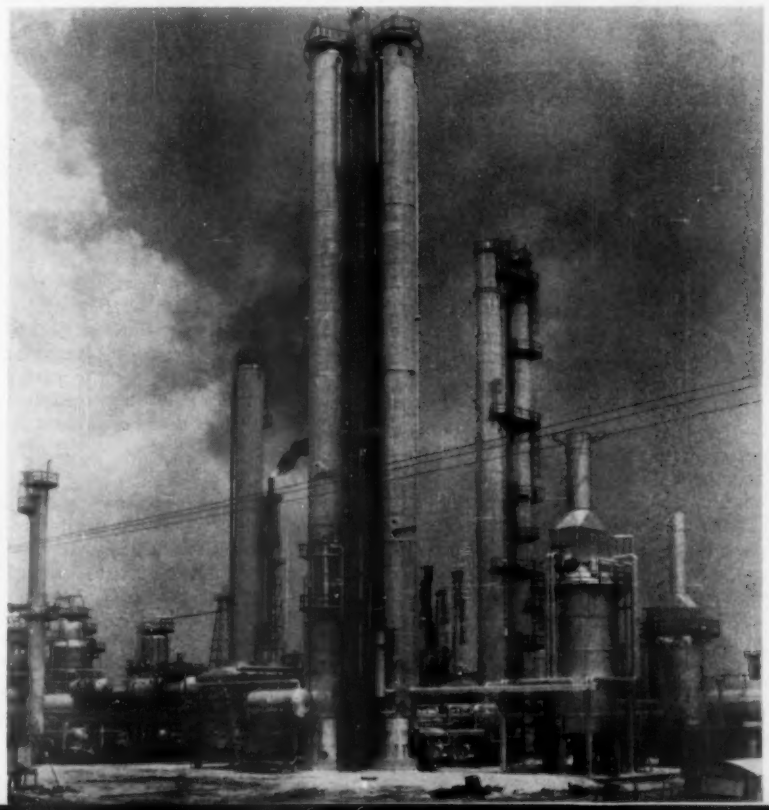
The 1401 system will serve principally as a satellite to each of the larger computers; first converting huge amounts of data to magnetic tape for processing on the big systems and subsequently producing the printed answers computed by the major units.

Duties. In addition to the high-speed processing of data for product inventory and delivery control, payrolls, and cost distribution, the new center will perform many scientific calculations to guide management's future decisions on refinery operations, marketing policies, and product development. More extensive evaluations of crude oil will be possible, and, by simulating the results of many combinations of manufacturing processes, the company hopes to develop improved refinery operations as well as additional petroleum products.

Tenneco Oil enters petrochemical field

TENNECO OIL CO., the producing, refining, and marketing arm of Tennessee Gas Transmission Co., Houston, has entered the petrochemical field with the completion of two new plants at the company's Chalmette, La., refinery. The plants, both handled by Badger Manufacturing Co., include a 2,200-bbl. per stream day Udex aromatics-extraction unit and BTX separation facilities and a 20-million-pound per year ethylbenzene plant.

The ethylbenzene plant employs part of the styrene process which was developed jointly by Cosden Petroleum Corp. and Badger. The Cosden-licensed process uses as feed mixed xylenes supplied by the Udex unit and, in a single process step, recovers polystyrene-grade ethylbenzene.



Final installment in this series

OIL-WELL PUMPING
PART 52

A look at current trends

BY JOSEPH ZABA

IN THIS, the concluding installment of the series, a brief review will be given of the progress made in the 17-year period since the original series was published, in methods, operating practices, and manner of meeting the problems of oil-well pumping. Some of these subjects were treated in more detail in the original series.

New methods. Continuous search is made for a new approach to the question of oil-well pumping. One approach radically different from the conventional methods now used, and which is now in experimental field use is the sonic pump.[1]

In this pump the whole tubing string acts as a pump with a check valve installed in each joint. Longitudinal vibration is induced in the tubing string by vibrating the surface end of the tubing at a rate corresponding to the fundamental frequency of tubing, placing it in resonance. With the speed of sound in steel a constant, the fundamental frequency is an inverse function of the length of the tubing string (Part 5).

Not all of the tubing is in motion during the operation of the pump. At the first harmonic the center of the tubing is practically motionless while the upper and lower portions of the string vibrate in opposite directions. As the frequency of vibration is increased, in whole-number multiples, the number of vibrating portions of the string increases. The amplitude of vibrations is held to no more than 0.5 in. The range of speed of operation is from 600 to 1,200 cycles per minute. On the downstroke the valves open moving through the fluid. On the upstroke they close, lifting the fluid. The inertia of the fluid establishes the continuous upward flow.

The surface equipment consists of helical springs supporting a steel plate connected to the tubing on which is installed an oscillator. This is a gear box with two shafts equipped with eccentric weights. The arrangement is such that horizontal forces cancel each other and the vertical forces impart vibration to tubing. The degree of unbalance of weights controls the amplitude of vibration. Conventional prime movers are employed.

Normalized J-55 tubing is used. To prevent fatigue failures the installations are designed to hold the dynamic stresses of tubing well below the endurance limit (Part 12). To prevent lateral vibration, the tubing string is equipped with centralizers spaced about 10 ft. apart. The over-all efficiency of the system is around 25%. Present depth limit of the method is around 4,000 ft.

About 50 sonic pumps are now in actual field operation. It is claimed that vibration of tubing prevents adhesion of paraffin, and that the pump is capable of handling substantial amounts of sand. Tests on some very shallow wells seem to substantiate these claims. However, there are still many questions regarding the economics of the method and the behavior of the pump under various well, fluid, and depth conditions. These questions can be answered only after many of these pumps are in operation over a long time.

Well servicing. The trend toward contract well servicing placed well-servicing equipment primarily within the province of the contractor. As far as oil-well pumping is concerned a recent survey showed that 47% of contractors' well servicing units are engaged in rod and tubing jobs.[2] The owner of a pumping well is interested mainly in the cost of servicing and for competitive reasons the contractor must insist on most efficient equipment. This equipment must also meet the requirements imposed by increasing depth of wells, by the need for mobility, and by the increased number of slim-hole completions.

Because of these facts, design of well-servicing equipment has undergone many changes and improvements. The accent is on mobility combined with sturdiness. There is an increased use of hydraulic power for operation of the servicing unit, of automatic controls, and of power tongs and power slips.

Operating practices. The industry's efforts toward reduction of oil-production costs are reflected in the introduction of new practices and in improvements in old ones. Of particular importance in the first group is the trend toward automatic operation of pumping installations.

Automatic control of part-time pumping, dating back to at least 1925, was one of the first attempts at automatic operation of oil leases. Lately, automation of lease production facilities has been growing at a very rapid rate. Of necessity this growth includes also oil-well pumping. The devices used for this purpose include flow-no-flow indicators, pumpoff controls, devices for shutting down wells in case of malfunction of the pumping equipment or of automated lease facilities, and of arrangements for advance programing of production to tie it in with automatic well testing. Other devices are in process of development and field testing.

Big savings resulted from the drift away from the poured-concrete foundation for beam-pumping units. This type of foundation fits only a specific size and make of unit. If changed well conditions require change in unit size, high cost is involved in removing the old and pouring the new foundation. Three approaches are used to reduce this cost.[3]

The first approach involves the use of the so-called "universal foundation." The unit is tied down along its center line by means of U-bolts to a piece of heavy drill pipe which is anchored in a trough along the center line of a concrete slab. This type of foundation can accommodate two or more sizes of units.

The second approach is use of portable foundations made out of prestressed, reinforced-concrete blocks.

Finally, there is an increase in use of factory, or homemade wide steel bases, integral with the skids of the unit which permit placing the unit on gravel or timber pads. There are some differences of opinion regarding advisability of using this arrangement as a permanent foundation for large units.

Good results have followed efforts to reduce lifting cost through systematic "problem-well studies." Often the high lifting cost of any given lease can be traced to only a few wells. The first step of such a study is isolation of these wells by keeping careful records on the frequency of and reasons for the pulling jobs. The second step is study of the wells, primarily by the use of a dynamometer, to determine the causes of the difficulties.

The third step requires taking necessary measures to eliminate these causes. The measures usually include changes in the design of the subsurface portions of the pumping system or changes in equipment.

Acoustic fluid determination has become a routine production operation. Ability to quickly determine the pump's submergence, or the well's bottom-hole pressure conditions is of real help in increasing pumping efficiency. A modern instrument for sonic fluid determination is sensitive and reliable. However, the problem of a foamy annulus fluid still remains unsolved.

Because of increasing pumping depths, and increasing cost of well-pulling jobs, makeup practices of rods and tubing are receiving increased attenton. This includes studies of make-up torque requirements and applying the results in actual field practice.

More frequent too is rod and tubing inspection by nondestructive tests, to reduce the causes of potential subsurface equipment failure before the equipment is run into the well.

Special problems. Handling of sand in pumping wells has been always a problem in the areas in which oil is produced from semiconsolidated or unconsolidated formations as found along the Texas-Louisiana Gulf Coast. With the advent of formation fracturing the problem became quite widespread, although the postfracturing sand problems are usually temporary in nature.

In different parts of this series mentions were made of the manner in which the sand problem is handled by design of different equipment components of different pumping systems. Here it should be pointed out that recently there has been a revival of interest in another approach to the problem, that is, in methods of prevention of entry of sand into the well bore. Studies of the subject, some of them dating back many years, are being reviewed and extended. Work is done on improvement of existing methods such as sand consolidation and gravel packing. New equipment is developed, such as for instance a screen of a 20-40-mesh, round Ottawa sand, bonded with a resin to the outside of a slotted or perforated liner. For protection against mechanical damage, centralizers are placed above and below the screen. Indications are that all this new work may result in definite alleviation of the sand problem.

Control of paraffin has been a subject of intensive study by the oil industry for more than 40 years. As far as pumping wells are concerned, much progress in paraffin control has been made by improvement in efficiency of commercial solvents, by use of the downhole butane injecton, by better design of mechanical scrapers, by use of plastic coatings, and by bottom-hole heating. The work of the last 2 or 3 years on paraffin inhibitors appears promising. Despite all these efforts, from the economic point of view the question of paraffin control cannot be considered as satisfactorily solved and paraffin remains an expensive pumping problem.

In contrast to paraffin, efforts toward development of corrosion protection for subsurface pumping equipment have been highly successful through development during the last 10 years or so of the organic, filming-type inhibitorss. At the same time during the last 3 or 4 years efforts have been renewed toward better understanding of the fundamental questions of fatigure and corrosion fatigue of metals and of the mechanism of hydrogen entry into iron to further improve corrosion protection of subsurface pumping equipment.

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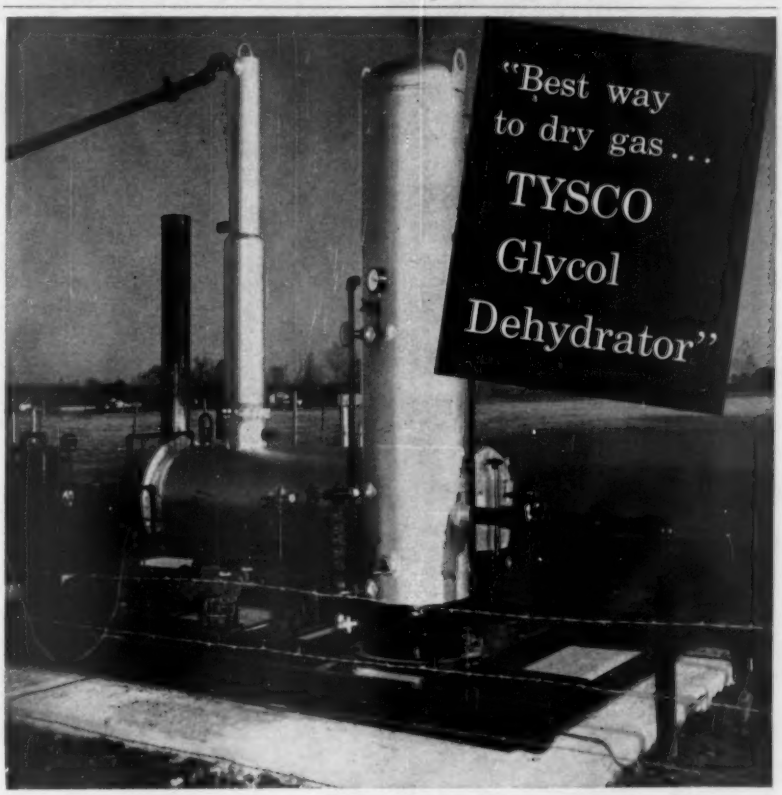
3. W. B. Bleakley, "Right Foundation Can Cut Costs": The Oil and Gas Journal, August 1, 1960.



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BY W. L. NELSON, Technical Editor and Petroleum Consultant

Depreciation, obsolescence, and similar costs

DEPRECIATION has seldom been mentioned in the Process Costimating series because the percentage depreciation allowed in computing income taxes on a basis of the original cost bears little relationship to the original meaning of the word. Originally, depreciation was considered as an amortization fund which in time would enable the operator to replace the equipment or plant when it became worn out or obsolete. Due to inflation during recent years, an amorization fund never becomes equal at the end of the depreciation period to the cost of new equipment.

Furthermore, many refinery equipments never become worn out because they must be maintained in substantially perfect working condition. Thus, maintenance becomes intimately related to depreciation. Only rarely must an equipment be discarded because it is obsolete or worn out, but it is necessary for the refiner to spend large amounts of capital for additions which improve the quality of products or the efficiency of the entire operation.

Table 1 is an effort to unscramble the complexities of so-called depreciation or at least to show the capital costs that a refiner must recognize. Column 3 showing obsolescence costs plus half the cost of improvements necessitated by obsolescence is probably close to a proper depreciation allowance. What has actually been allowed by tax laws is somewhat as shown in Column 6 which is the depreciation suggested in Bulletin F of the Bureau of Internal Revenue, but corrected for inflation. Negative means a loss to the refiner rather than a depreciation allowance.

The last column indicates the true magnitude of the capital costs that the refiner must meet, namely (1) interest on bonded indebtedness or dividends to stockholders (3-6%), (2) improvements that are necessary if the refiner is to maintain quality and efficiency, and (3) obsolescence of the refinery equipment. In addition, perhaps the refinery should be paid for over a period of 20-30 years which means 3.33-5% more but this is based on original (not replacement) cost. Finally, capacity increases during the last 10 years have called for additional capital expenditures amounting to about 4% of the current replacement cost. Increases in capacity have been a necessity because they enable the refiner to operate sizes of new process equipment that are economically feasible.

TABLE 1—RELATIONSHIP BETWEEN CAPITAL COSTS, DEPRECIATION AND MAINTENANCE.
Percentage of Replacement Cost (5 Yr. running average)*

	(1) Additions or Improvements†	(2) Obsolescence†	(3) Obsolescence plus half of Improvements†	(4) Inflation in Construction Costs‡	(5) Depreciation allowed by Bulletin F*	(6) Depreciation minus Inflation*	(7) Maintenance	(8) Refiner's Capital Costs (1) & (2) plus Int.§
1926	8.98	5.88	10.37	0.83	4.5	3.67	4.5	20.86
1927	8.98	5.88	10.37	−0.83	4.5	5.33	4.5	20.86
1928	7.92	5.85	9.81	0.50	4.5	4.00	4.5	19.37
1929	8.73	5.85	10.21	00	4.5	4.50	4.5	20.58
1930	8.93	5.85	10.31	−2.34	4.5	6.84	4.5	20.72
1932	5.05	2.02	4.54	−4.57	4.5	9.07	4.4	10.07
1934	5.44	2.44	5.16	−2.42	4.5	6.92	4.5	10.88
1936	11.28	4.73	10.37	1.06	4.6	3.54	4.7	19.01
1938	10.28	4.32	9.46	6.34	4.6	−1.74	5.1	17.60
1940	11.40	4.30	10.00	4.43	4.7	0.27	5.5	19.70
1941	2.17	0	1.08	3.56	4.7	1.14	5.8	6.17
1942	3.82	0	1.91	2.34	4.7	2.36	6.1	7.82
1943	3.63	0	1.81	2.44	4.7	2.26	6.5	7.63
1944	4.61	0	2.30	2.84	4.7	1.86	6.9	8.61
1945	3.26	0	1.63	2.99	4.8	1.81	7.3	7.26
1946	3.15	0.54	2.11	4.87	4.8	−0.07	7.7	7.65
1947	3.15	0.54	2.11	7.35	4.8	−2.55	7.7	7.69
1948	1.48	0.54	1.28	9.29	4.8	−4.49	7.2	6.02
1949	0.51	0.54	0.79	10.04	4.8	−5.24	6.8	5.05
1950	5.89	0.54	3.48	10.56	4.9	−5.66	6.6	10.43
1951	7.12	0	3.56	9.56	4.9	−4.66	6.5	11.12
1952	8.33	0	4.16	6.98	4.9	−2.08	6.5	12.33
1953	11.16	0.23	5.81	5.55	4.9	−0.65	6.4	15.39
1954	14.41	0.23	7.43	5.18	4.9	−0.28	6.2	18.64
1955	8.94	0.23	4.70	4.77	5.0	0.23	5.8	13.17
1956	9.80	0.43	5.33	4.47	5.0	0.53	5.3	14.13
1957	8.67	0.51	4.84	4.74	5.0	0.26	5.1	13.12
1958	5.84	0.28	3.20	4.31	5.0	0.69	5.0	10.12
1959	2.59	0.28	1.58	4.34	5.0	0.66	4.9	7.87

*Depreciation is based on original cost, not on replacement cost.
†Based on Process Costimating No. 90, March 6, 1961, p. 143, and Process Costimating No. 92, April 17, 1961, p. 113.
‡Based on Nelson Refinery Construction Cost Index after 1930 and on E.N.R. Index before 1930.
§Interest or dividends on refinery investment was about 6% during 1926-1931; 3% 1932-1939; and 4% 1940-1959. In addition, perhaps the capital needed for necessary increases in capacity and for repayment of original cost, should also be included in this column.

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Here's a new way to get

True resistivity from induction logs

BY R. H. LINDLEY
Electric Log Consultant
and
C. R. DAVIS
Shell Oil Co.
Both of Midland, Tex.

Finding formation-water saturation is a hard job if true resistivity is unknown. And finding true resistivity is a hard job because of mud-filtrate invason. Here's a new method, using two different induction logs, that bypasses the problem of filtrate invasion, and provides a workable value of true resistivity. And no expensive intermediate runs are needed.

TRUE RESISTIVITY is often the key to recognition of commercial production from well logs.

But, it can't be found by direct measurement.

True resistivity is the resistivity of the formation undisturbed by the drilling process or by drilling fluids. The recorded resistivity value from today's logging tools is often influenced by the drilling fluids, so the problem facing us is to use available data and calculate true values.

The problem. Formation - water saturation must be found if we are to arrive at a reasonable estimate of hydrocarbon productivity. Water saturation must be found by indirect means, and they usually involve some form of the Archie equation:

$$S_w^n = \frac{R_w}{\phi^m R_t} \qquad (1)$$

Where:

S_w = formation-water saturation
ϕ = porosity
R_w = formation water resistivity
R_t = true formation resistivity
n = saturation exponent
m = cementation factor

The importance of knowing true resistivity, R_t, in Equation 1 cannot be overemphasized. Costly testing of water-bearing formations can be eliminated if a good value of S_w, based on a good R_t, is known.

The induction log has been shown to be the most satisfactory method of recording resistivity in wells drilled with any fluid except salt-base muds. This is because it is possible to investigate deeper into a formation with induction logs than with any other resistivity device having usable thin-bed resolution.

Under favorable conditions the newer induction tools will record true resistivity directly. Taking advantage of these favorable conditions, the problem of finding true resistivity with induction logs was approached this way:

A 6FF40 induction log was run through a given zone immediately after it was drilled. This log recorded very close to true resistivity. Some 6 weeks later the same zone was logged with three logging devices—5FF40 and 6FF40 induction, and a 16-in. normal. None of these recorded true resistivity because of invasion of mud filtrate into the formation. These later logs were then used to calculate true resistivity, using the original log as a check on the procedure.

Results were satisfactory, and once the procedure is established, there is no need for the original log. On any well logged only once at total depth, true resistivity can be found if the three curves are run.

Why several resistivity measurements? Main reason resistivity devices do not generally record R_t directly is that zones with enough

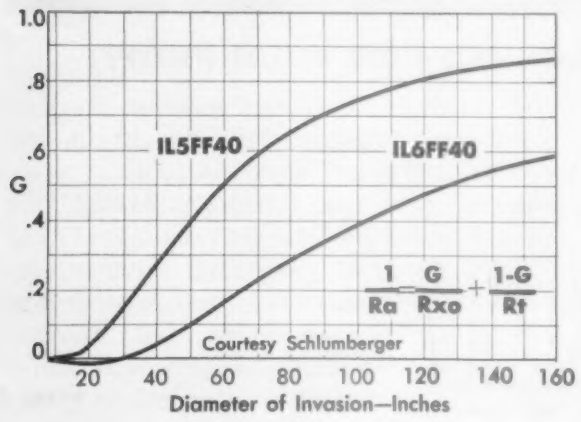

Fig. 1.

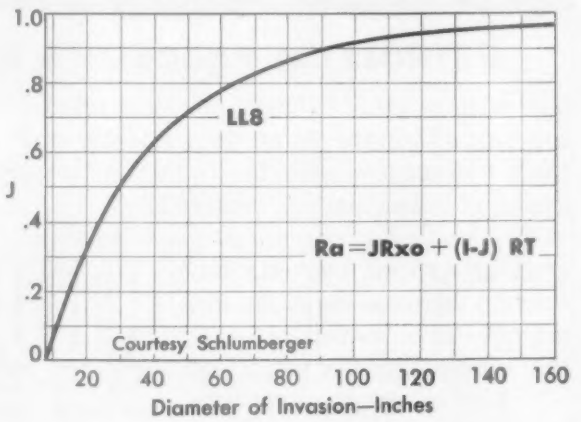

Fig. 2.

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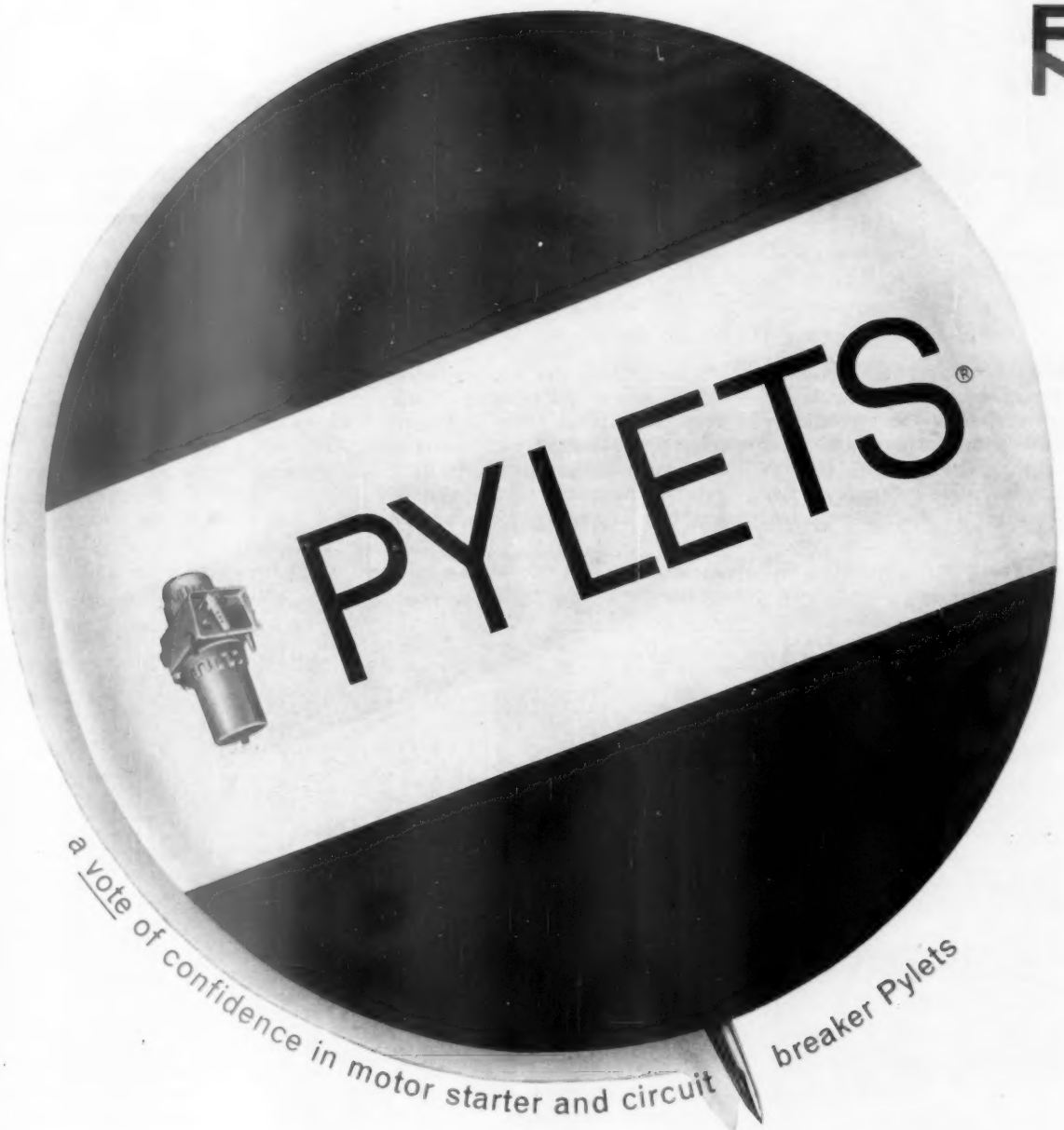


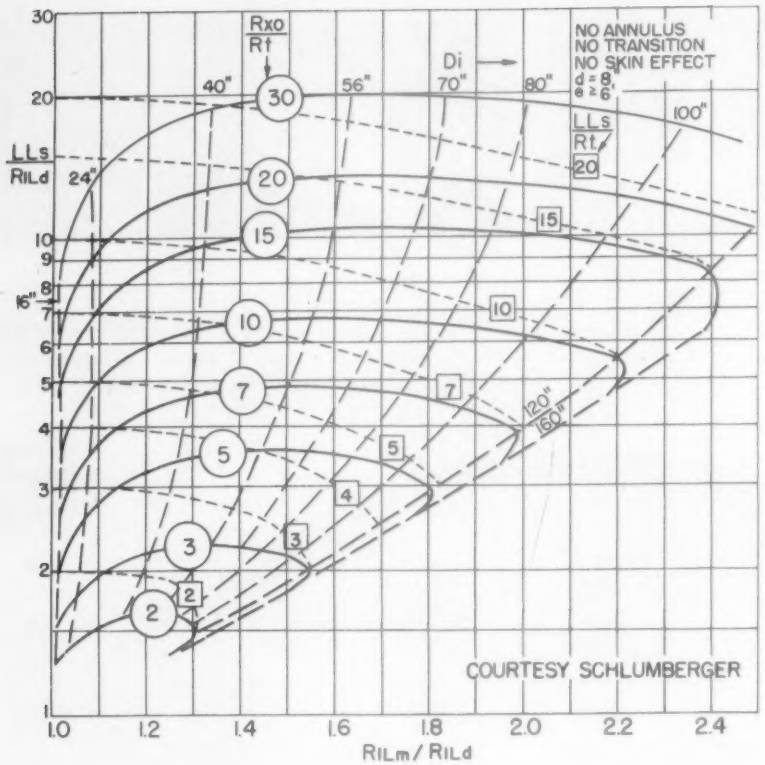


Fig. 3.

permeability to be of commercial interest are normally contaminated (or invaded) near the borehole by the drilling fluid. This requires that the logging device "see" through the contamination before it reaches its objective, the undisturbed zone.

Character of this contamination can be varied and complex. It has been pointed out[1,2] that a knowledge of the character of the contamination is necessary for the most exact determination of R_t. Also, at least four independent measurements of resistivity are necessary to describe that character.

The solution. For the purposes of this paper, we will assume the simplest and most conventional "square wave" invasion pattern. Making this assumption, we can then investigate the more important aspect of formation contamination, the invasion diameter, Di.

With the conventional assumption of invasion profile, the response of a deep-investigation induction log, such as the 6FF40, can be expressed as:

$$\frac{1}{R_{ILd}} = \frac{G_6}{R_{xo}} + \frac{1-G_6}{R_t} \quad (2)$$

Where:

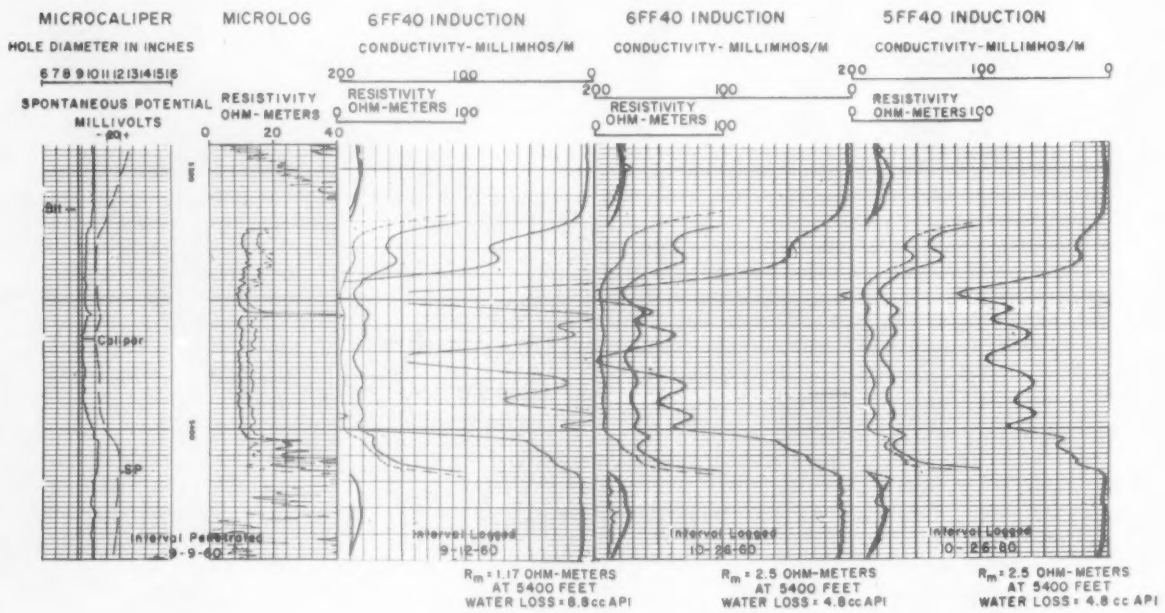
R_{ILd} = apparent resistivity, read from the deep-reading induction log and corrected for bore hole and thin bed effects, if necessary

R_{xo} = resistivity of the invaded zone

R_t = true resistivity of the uncontaminated zone

G_6 = response characteristic of the 6FF40 induction log

The term G_6 is used to symbolize the integrated radial geometric factor of the 6FF40 and is plotted versus depth of invasion in Fig. 1. This value is derived from the physical and electrical properties of the tool and predicts the response of



LOGS from example well. Fig. 4.

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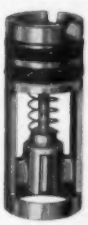

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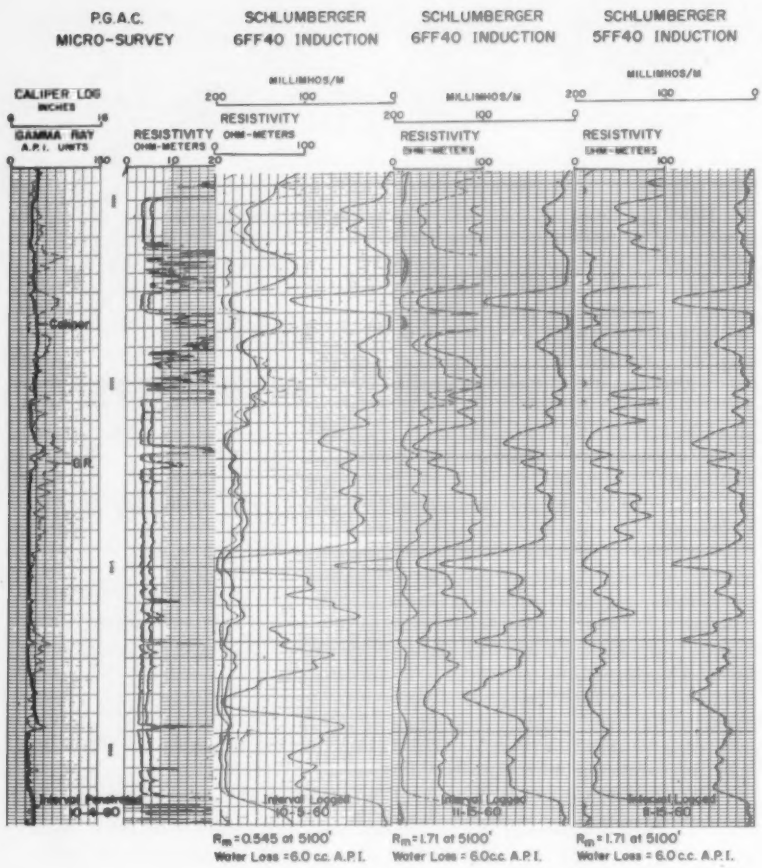

LOGS from example well. Fig. 5.

the tool when the formation geometry is known.

To illustrate, assume that R_t = 10 ohm-meters, R_{xo} = 50 ohm-m. and Di = 160 in.

From the 6FF40 curve of Fig. 1, G_6 is given as 0.58. This means that the total tool response is made up of the sum of 58% of the invaded zone conductivity plus 42% of the undisturbed zone conductivity.

Substituting these values into Equation 2

$$\frac{1}{R_{ILd}} = \frac{0.58}{50} + \frac{1-0.58}{10}$$

Solving this equation reveals that the response of a 6FF40 opposite this formation would be 18.6 ohm-m.

Obviously, if R_{ILd}, R_{xo}, and Di are known, R_t may be found in like manner.

R_{ILd} is the only parameter used in this equation that can be determined from the recording of the deep investigation induction log so three unknowns remain: R_{xo}, R_t and G_6 (a variable dependent on Di).

Where three independent variables are unknown, three equations involving only these unknowns are necessary to determine any of them. Since R_t is desired, there must be two other equations provided in order to obtain a solution.

Commonly run simultaneously with the 6FF40 is a medium-shallow investigation resistivity device such as the 16-in. normal.

The response of this device can be approximated by:

$$R16_c = R_{xo} J_{16} + R_t (1 - J_{16}) \quad (3)$$

Where:

$R16_c$ = apparent resistivity of the 16-in. normal after correction for borehole and thin-bed effect.

J_{16} = a response characteristic of the 16-in. normal which can be approximated from Fig. 2 when Di is known. Actually, Fig. 2 is a response characteristic of the Laterolog 8 which is a focused, and therefore more desirable, device; however, the 16-in. normal has approximately the same depth of investigation as the LL-8 and may be used to replace the LL-8 when the 16-in. normal can be corrected for the effects of the mud column and adjacent beds[3].

R_{xo} = same value described by Equation 2.

R_t = same value described by Equation 2.

TABLE 1—DATA FROM VARIOUS LOGGING DEVICES USED IN EXAMPLE WELLS

Zone	Figure	Depth Interval (ft.)	R16 2nd Run	R16c	R16c/R_{ILd} 2nd Run	R_{ILm}/R_{ILd} 2nd Run	Di In.	R16c/R_t	R_t Calculated	R_{ILd} 1st Run	R_{ILd} 2nd Run	R_{ILm}
1	4	5,324-32	60	42.5	2.04	1.92	≥160	. . .	*12.2	12.5	20.8	40
2	4	5,346-52	21	16	3.34	1.77	103	5	3.2	2.7	4.79	8.48
3	4	5,369-77	22	17	3.36	2.08	≥160	. . .	*2.57	2.8	5.05	10.52
4	4	5,386-92	27	21.2	3.18	2.05	≥160	. . .	*3.42	3.73	6.67	13.7
5	5	4,900-06	87	65	2.14	1.61	140	3.5	18.6	17	30.3	48.8
6	5	4,922-27	85	61.5	1.85	1.5	140	2.95	20.8	19.2	33.3	50
7	5	4,952-60	28	17.1	1.68	1.1	30	1.7	10.05	8.7	10.2	11.2
8	5	5,026-34	24	16.8	1.27	1.13	70	. . .	11.37	11.9	13.2	14.7
9	5	5,050-56	73	63.3	1.9	1.57	≥160	. . .	*20.1	23.2	33.3	52.5
10	5	5,064-89	92	83.8	2.18	1.86	≥160	. . .	*22.0	25	38.5	71.5
11	5	5,094-02	28	20.5	3.04	1.64	88	4.25	4.83	3.78	6.75	11.1
12	5	5,105-12	67	58.1	3.14	1.97	≥160	. . .	*9.08	10.6	18.5	36.4
13	5	5,147-55	68	58.1	3.25	1.86	118	5.5	10.56	12.5	17.9	33.3
14	5	5,168-80	37	28.7	3.42	1.7	90	4.75	6.04	5.26	8.4	14.3
15	5	5,200-07	57	43.6	3.05	1.7	99	4.5	9.7	8.7	14.3	24.4
16	5	5,212-21	54	41	2.77	1.69	110	4.15	9.9	9.8	14.8	25
17	6	9,158-67	69	54.7	3.72	1.29	42	3.9	14.0	13.9	14.7	19.0
18	6	9,272-82	81	73.7	3.24	1.04	19	3.24	22.8	22.2	22.8	23.8
19	6	9,404-08	79	60.7	5.5	1.16	30	5.6	†10.8	8.48	11.0	12.8

Since $R16_c$ can be obtained from the logs, and J_{16} is again a dependent variable of Di, there exist three independent unknowns with only two equations and the objective, R_t, cannot yet be determined.

The most suitable and commonly available device with which to obtain the required third relationship is a medium-investigation induction log (5FF40).

The response of this tool can be expressed by:

$$\frac{1}{R_{ILm}} = \frac{G_5}{R_{xo}} + \frac{1-G_5}{R_t} \qquad (4)$$

Where:

R_{ILm} = the apparent resistivity given by the medium investigation induction log (5FF40).

G_5 = response characteristic of the 5FF40 which can be determined from Fig. 1 when Di is known.

The measurements of the 6FF40 induction log, the 5FF40 induction log, and the 16-in. normal therefore provide three equations which allows a solution for R_t even when none of the devices measures R_t.

It is possible to solve these three equations for R_t arithmetically. The equations are not linear, however, so this type of solution is extremely tedious for routine analysis. A more convenient method of obtaining the desired information is by the use of a chart such as Fig 3.[4]

Fig. 3 can be used when R_{xo} is greater than R_t (the normal condition in West Texas for wells drilled with fresh mud) and is based on the assumption of the conventional "square-wave" invasion profile.

To use Fig. 3, enter the ordinate with the ratio R_{LLs}/R_{ILd}. (As mentioned above, $R16_c = R_{LLs}$.) Enter the abscissa with the ratio R_{ILm}/R_{ILd}. Proceed horizontally from the ordinate and vertically from the abscissa until the two lines intersect. The point of intersection will, by interpolation, give Di, R_{xo}/R_t, and R_{LLs}/R_t. From the last ratio, R_t may be simply determined since R_{LLs} is known.

Example calculations. Figs. 4, 5, and 6 are presented as examples whereby the theoretical concepts upon which Fig. 3 is based, may be verified. These illustrations are actual examples of logs run in the West Texas area where there was a deep-investigation induction log (6FF40) run very shortly after the

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intervals were drilled. It is felt that this resistivity recording very closely approaches R_t since the elapsed time between penetration and logging is short, and moderately low water-loss muds were used for drilling fluid. In addition, each of the intervals was relogged, at a considerably later date, with a short investigation resistivity device (16-in. normal), a medium investigation resistivity tool (5FF40), and again with the deep investigation 6FF40. Also presented on each of the illustrations is a microdevice with caliper to aid in the selection of zones suitable for analysis.

In the example we found R_t from the second run of logs (logged after considerable invasion took place) by use of Fig. 3. The calculated R_t was then verified by comparison with the first run of 6FF40, which, as mentioned above, recorded very close to R_t. This calculated value generally is considerably lower than the later recorded resistivities, sometimes as little as ½ R_{ILd}, the value given by the best single resistivity device available, and more dramatically as little as ¼ R_{ILm}, the value often used as R_t less than 1 year ago. A correction to resistivity of this magnitude can be seen to be enough to change the valuation of a zone from possibly oil bearing to definitely water bearing.

The recordings of the various devices are listed in Table 1. The first 18 zones selected for study have been taken from beds of at least 6-ft. thickness, which is considered to be the minimum for which the adjacent bed effect upon the medium and deep investigation induction logs may be disregarded. The 16-in. normal has been corrected for borehole and thin-bed effect for each zone studied.

The chart, Fig. 3, does not describe zones of invasion greater than 160 in. since most of the devices used in running the logs lose resolution beyond that diameter. However, processing the tabulated ratios $R16_c/R_{ILd}$ and R_{ILm}/R_{ILd} reveals that some of the points (marked by asterisk) indicate extreme invasion. If these zones are admitted to be invaded to at least 160-in. diameter, $R16_c$ can be equated to R_{xo} and a maximum value of R_t can be determined by use of Fig. 1 and the transposition of Equation 2 into:

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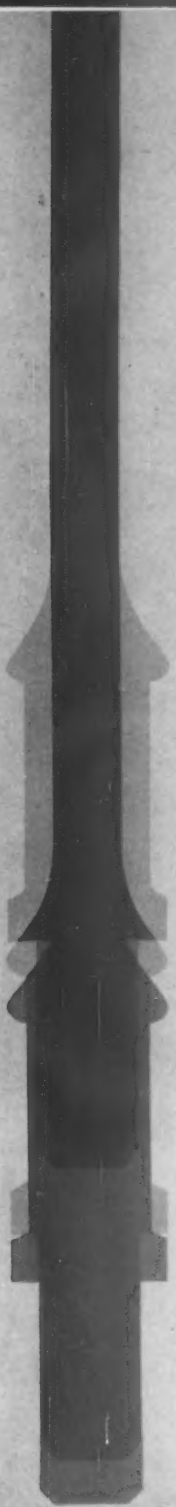

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$$R_t = \frac{R_{xo}(1-G_6)}{(R_{xo}/R_6)-G_6}$$

Zone 8 falls in a section of the chart which is hard to interpolate for R_{LLa}/R_t. However, since all lines representing invasion must converge at $R_{LLa}/R_{ILd} = 1$ and $R_{ILm}/R_{ILd} = 1$, Di may be approximated for this point. With this value, Di = 70 in., Equations 2 and 4 are easily solved simultaneously to obtain R_t from R_5, R_6, and Fig. 1.

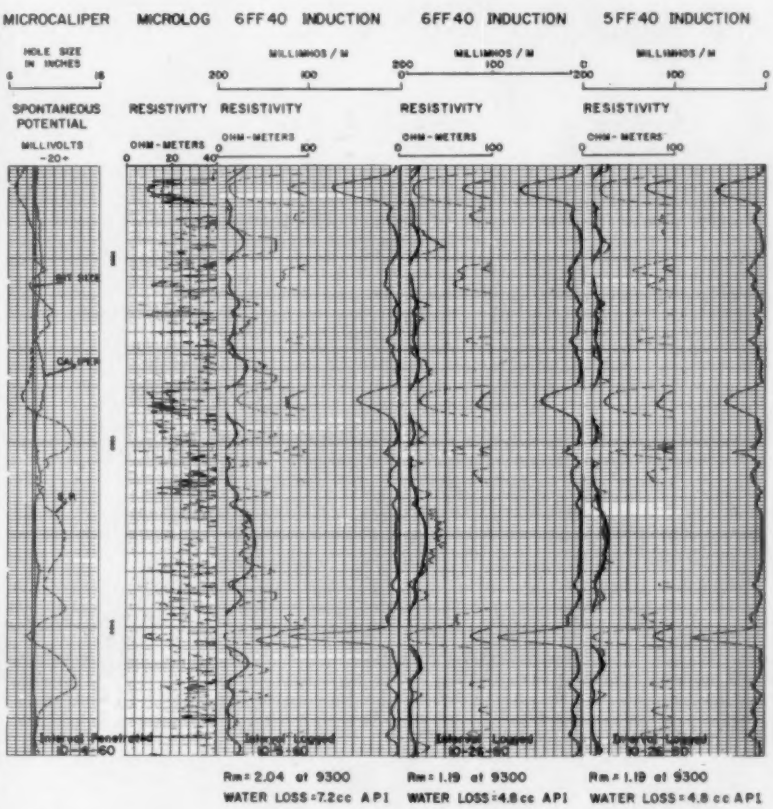
Zone 19 was included to show the problem incurred when a bed thinner than 6 ft. is processed through the chart, Fig. 3, without correction for bed thickness. As seen from the tabulation, the calculated R_t (marked by dagger) reveals that the effects of invasion were smaller than the thin-bed effect.

All calculated values of R_t have been listed in Table 1 for comparison with the measured values of R_t. In each zone, the measured and calculated values of R_t are sufficiently close so that either of them would lead to the same prediction of probable production.

Limitations. This method of calculating R_t should now be limited to beds of at least 6-ft. thickness. The exact method of correcting for thinner beds is too uncertain to assure accuracy and the vertical resolution is not the same for the medium as it is for the deep investigation devices. There are several points in Figs. 5 and 6 that show that the medium device has better vertical resolution than the deep-investigation tool. In these particular zones, the problem of vertical resolution is greater than the problem of invasion; in Fig. 5 at 4,980 and 5,008 ft., and in Fig. 6 at 9,207, 9,231, 9,245, 9,305, 9,377, 9,431, 9,445, and 9,458 ft. are such zones.

A further limitation of the proposed method of calculating R_t lies in the assumption of the geometry of the interface between the invading mud-filtrate front and the original reservoir fluids. The subject method contemplates only the simplest regular pattern, that of a nearly vertical interface parallel to the borehole advancing laterally into the formation without creating a bank of formation water or oil.

If this invading mud filtrate



LOGS from example well. Fig. 6.

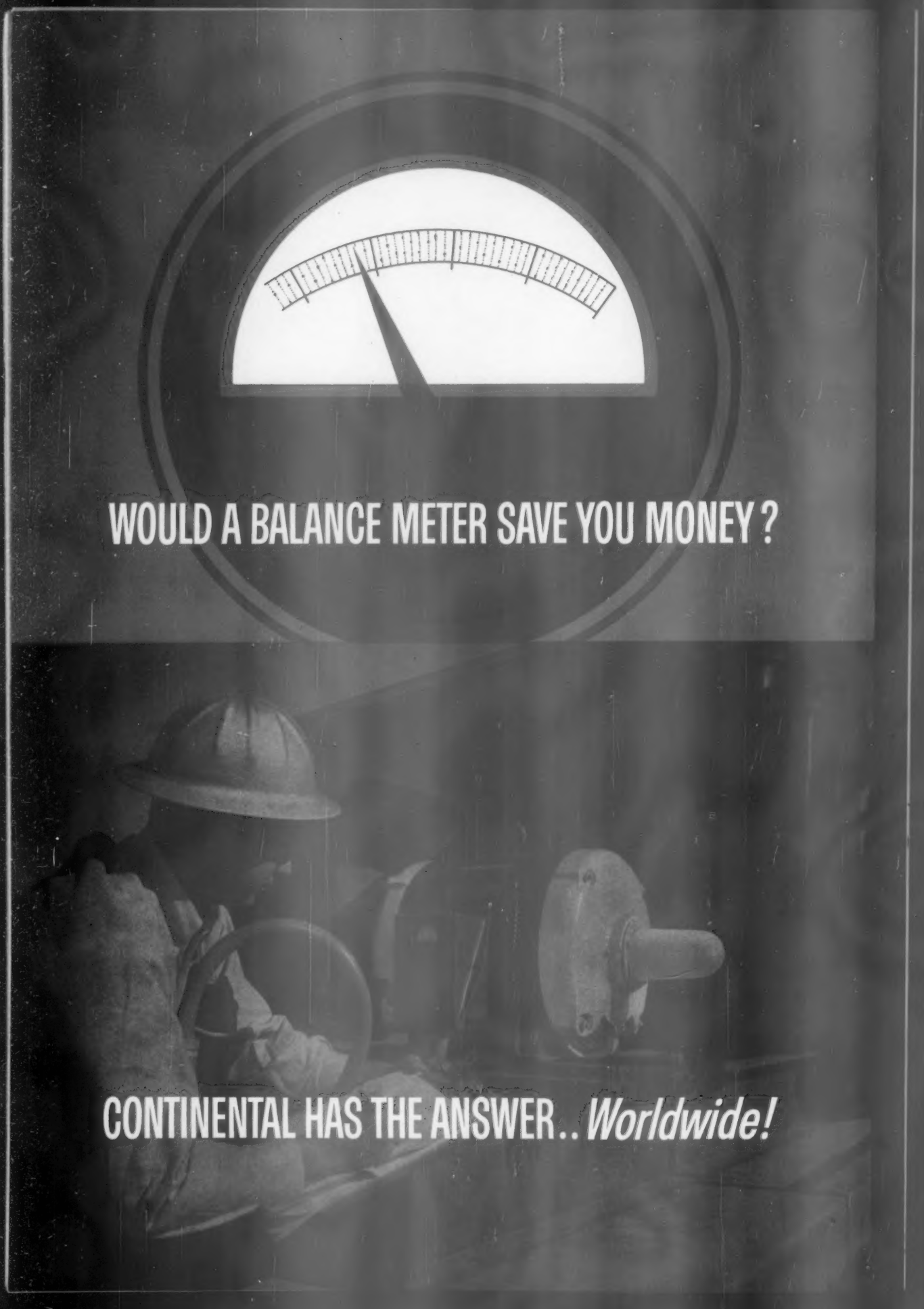

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TABLE 2—COST COMPARISON—DIFFERENT LOGGING PROGRAMS

CASE 1—TWO INTERMEDIATE LOGS

Log	Depth-Ft.	Service Charge	Depth Charge	Operation Charge	Total
ILd-LL	6,000	$150	$480	$480	$1,110
ILd-LL	8,500	150	680	200	1,030
GR-Sonic	10,000	150	700	800	1,650
Microlog	10,000	...	500	360	860
ILd-LL	10,000	...	800	480	1,280
TOTAL					$5,930

CASE 2—NO INTERMEDIATE LOGS, TWO INDUCTION LOGS AT TD

Log	Depth-Ft.	Service Charge	Depth Charge	Operation Charge	Total
GR-Sonic	10,000	$150	$700	$800	$1,650
Microlog	10,000	...	500	360	860
ILd-LL	10,000	...	800	480	1,280
ILm	10,000	...	500	120	620
TOTAL					$4,410

CASE 3—THREE BASIC LOGS ONLY

Log	Depth-Ft.	Service Charge	Depth Charge	Operation Charge	Total
GR-Sonic	7,000	$150	$490	$560	$1,200
Microlog	7,000	...	350	240	590
ILd-LL	7,000	...	560	320	880
TOTAL					$2,670

CASE 4—THREE BASIC LOGS PLUS MEDIUM INDUCTION LOG

Log	Depth-Ft.	Service Charge	Depth Charge	Operation Charge	Total
THREE BASIC LOGS	...	...	...	...	$2,670
ILm	7,000	...	$350	$ 80	430
TOTAL					$3,100

should create a low-resistivity annular bank of formation water, or if it should proceed in a very non-uniform or transitional manner, it would be difficult to calculate R_t accurately without a fourth resistivity curve. Under these conditions, the "grand slam" system is necessary for finding resistivity.

Cost of Two-Induction Log Program

In the past, a prudent engineer generally attempted to circumvent the effects of invasion on the induction log by running one or two intermediate logs. Typical costs of the two approaches for a 10,000-ft. well, where resistivity logs are wanted over all the interval below 4,000 ft. and a gamma ray-sonic is wanted over the entire hole are shown as cases 1 and 2, Table 2.

Case 2 represents as reliable a logging program as Case 1 and yet the savings amount to about $1,520, a reduction of 25% from the cost of Case 1. This does not include the additional saving of rig time.

Now consider a second example where the operator originally planned only one run of basic logs at total depth. The second induction log now represents a cost increase. Suppose we have a 7,000-ft. well where resistivity logs are needed over the bottom 4,000 ft. and a gamma ray-sonic log is wanted over the entire hole. Case 3 of Table 2 shows the cost of three basic logs only, and Case 4 the cost of the three basic logs plus one medium investigation induction log.

Here, the increase is $430 or 16%, but the quality of the program has improved many fold.

Acknowledgments

The authors express their appreciation to Shell Oil Co. for permission to release and publish this paper. Special appreciation is extended to W. R. Laws, of El Rancho de la Paz, Costa Rica, for assistance in preparation of this paper.

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4. This chart was derived by Schlumberger from the original work in References 1, 2 above.

National oil policy is boon to Canadian industry

BY GENE T. KINNEY
East Coast Editor

NOT SINCE the Suez crisis has the Canadian oil-producing industry had a shot in the arm with results so sudden and dramatic.

On February 1 of this year the government invoked its first national oil policy. The aim was to boost lagging production. Exports to the United States would be increased, and the Canadian market west of the Ottawa Valley in Ontario would be fenced off for domestic supplies.

In only half a year's existence, the policy has succeeded even beyond the expectations of its sponsors. And its impact should be more lasting than the ephemeral export demand created by the curtailment of Middle East supplies when the Suez Canal was closed in 1956.

Although a sluggish economy has slowed domestic market growth, the Canadian oil industry is heading for a new set of records under this new stimulus:

... **A 9 to 10% increase** in total demand for 1961 rising from 975,000 bbl. daily last year to more than 1,000,000 bbl. daily for the first time.

... **A 16% increase** in crude-oil and natural-gas liquids production from 544,000 bbl. daily to 630,000 bbl. daily.

... **A 44% increase** in exports of crude oil and natural-gas liquids from 115,000 bbl. daily to 165,000 bbl. daily.

... **A 5% increase** in domestic demand from 850,000 bbl. daily to 900,000 bbl. daily.

These forecast figures, shown in the accompanying table, represent an industry consensus, and would in every case be record highs.

CANADIAN SUPPLY AND DEMAND 1960-63

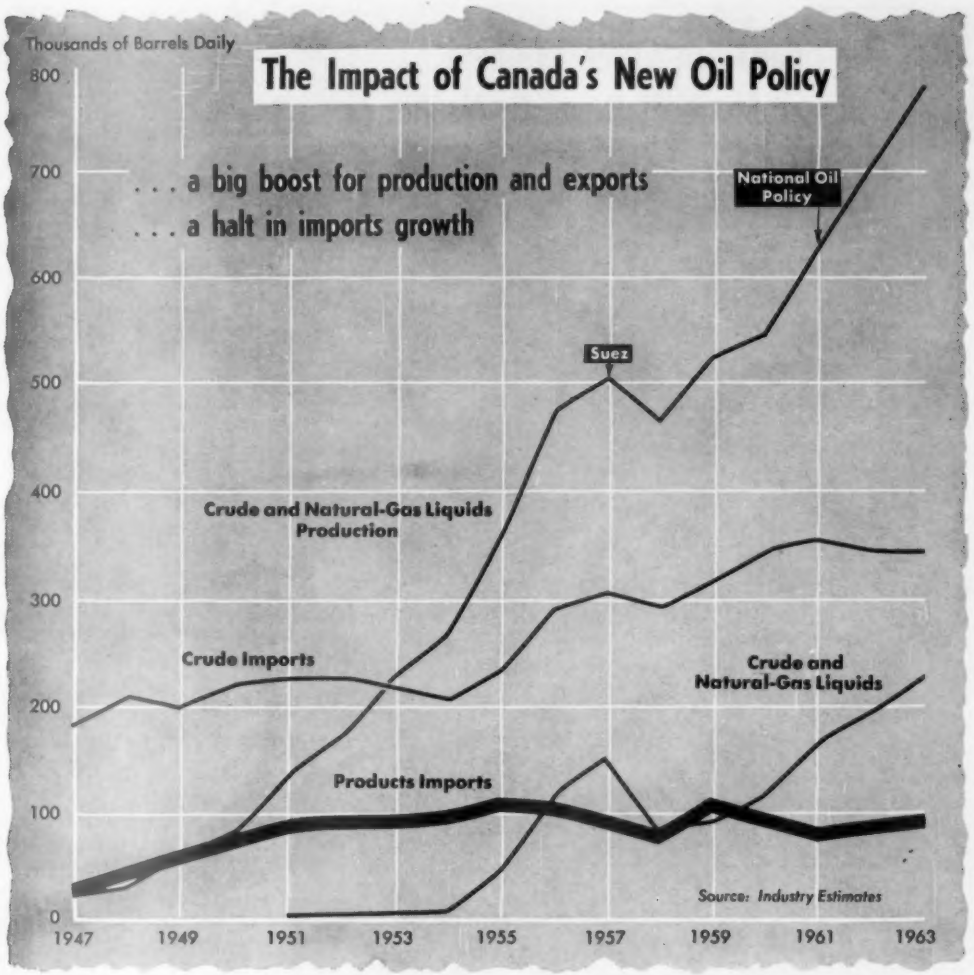
	1960	1961	1962	1963
DEMAND				
Motor gasoline	274	284	296	308
Distillates	274	298	309	320
Residuals	136	146	154	160
Other	102	110	117	124
Use and loss	58	62	66	70
TOTAL DOMESTIC	854	900	942	982
Crude exports	115	165	195	230
Products exports	6	6	6	6
Export demand	121	171	201	236
TOTAL DEMAND	975	1,071	1,143	1,218
SUPPLY				
Production	541	631	708	780
Crude imports	343	355	346	345
Products imports	91	85	89	93
Total imports	434	440	435	438
TOTAL SUPPLY	975	1,071	1,143	1,218

Oil-policy goals. As the industry entered 1961, it was trying to recover from a year of keen disappointment.

Domestic demand for Canadian oil actually declined last year, and production was more than 150,000 bbl. daily below the old Borden Commission target of 700,000 bbl. daily. Alberta was producing at less than half of capacity.

Development had greatly outstripped markets. The giant strides made by the industry in its 13 years of modern history were obscured by the size of the excess producing capacity. The cry for the government to "do something" to give Canadian producers more of their home market grew shrill.

In this situation the government stepped in with the national oil policy to expand markets for Canadian oil. Minister of Trade and Commerce George Hees set production goals for crude and natural-gas liq-



uids of 625,000 bbl. daily by mid-1961, 640,000 bbl. daily average for the full year 1961, and 800,000 bbl. daily in 1963.

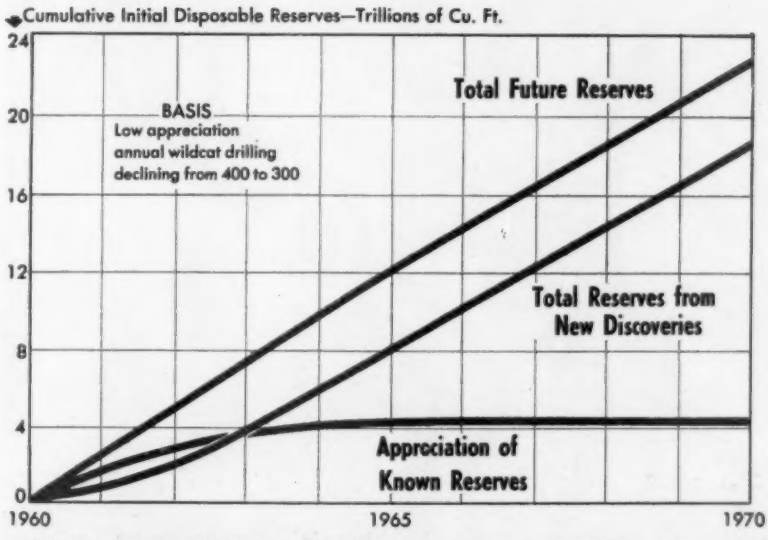
He rejected proposed mandatory imports controls that would have turned over the 250,000-bbl.-daily Montreal market to western producers and required an Alberta-Montreal crude pipeline. He chose instead a voluntary approach designed to increase markets for Canadian production by an equivalent amount.

To achieve these targets, Hees suggested that the industry:

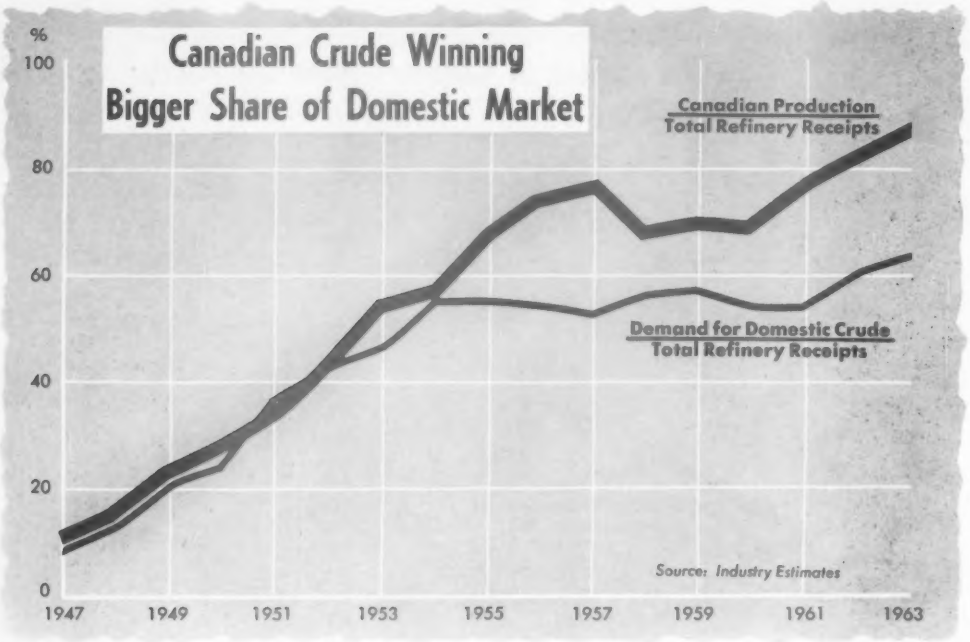
. . . **Increase exports** to the United States.

. . . **Eliminate 10,000 bbl.** daily of crude imports into Ontario.

. . . **Progressively reduce** direct products imports and products transfers from Montreal refineries



ANTICIPATED FUTURE GAS RESERVES for the Province of Alberta. Gas production and transportation loom large in Canada's future. Source: Alberta Oil and Gas Conservation Board report, June 1961.



operating 100% on foreign crude.

... Construction in Ontario of new refinery capacity to supply the portion of the Ontario market west of the Ottawa Valley that had been supplied from foreign sources.

The 250,000-bbl.-daily increase in production would be achieved by increasing exports 125,000 bbl. daily; by displacing imports and Montreal transfers west of the Ottawa Valley; and by normal growth in the existing Canadian market. Displacements and market growth were to contribute roughly equal volumes to meet oil-policy goals.

If the voluntary approach did not work, Hees held over the heads of importers the threat of mandatory imports controls.

Response to oil policy. The effect of Hees' announcement was electric.

Considering that the program was voluntary, and that it would mean money out of the pockets of several companies, most acted with surprising speed to implement the policy. In a remarkable display of cooperation, no one seriously challenged the program, although realism was urged in judging industry performance.

GAS-PIPELINE construction in Alberta is typified by this project of Alberta Gas Trunk Line Co., Ltd. Line size for the new system is 22, 30, and 36-in.

As one importer explained the almost unanimous support of industry: "To be sure, it will cost all of us profits, but the alternative to compliance with the voluntary program is incomparably worse."

Montreal refiners, advised to earn the privilege of importing by finding a home for more Canadian crude, speeded deals that in some instances were already in the works. Pressure was exerted on Shell, Texaco, British American, Imperial, Canadian Petrofina, and BP Canada to arrange for new export or domestic markets.

Almost immediatley exports were stepped up to the Puget Sound refineries of Shell, Texaco, and Mobil. The newly opened market in Detroit-Toledo was broadened with sales to refineries of Gulf, Mobil, and Standard of Ohio. By May, Buffalo was added to the list when Ashland became a new Canadian customer.

In one case an importer in Montreal arranged to purchase Alberta crude and sell it at a discount to a U. S. refiner, bearing the discount himself. Such was the seriousness with which the voluntary policy was taken.

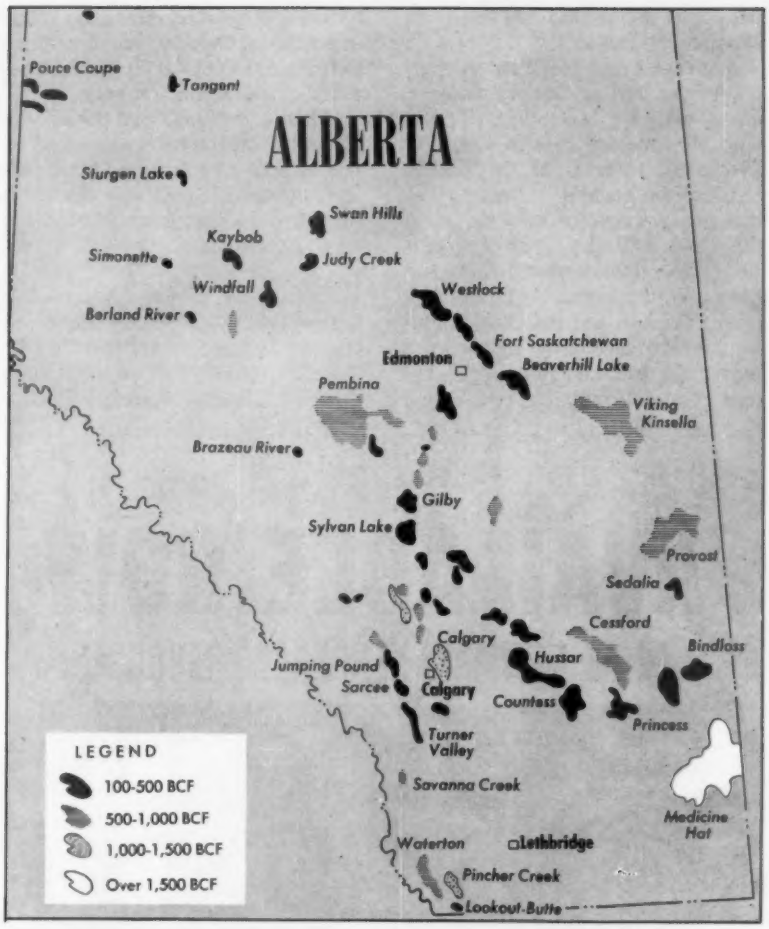
This concerted campaign lifted exports 37,000 bbl. daily to an average of 155,000 bbl. daily for the first 6 months of 1961. The mid-year level approached 200,000 bbl. daily.

Mainly as a result of the export growth, first-half production of crude and natural-gas liquids averaged 613,000 bbl. daily (599,000 of crude and condensate and 14,000 of LPG) compared with the 1960 first-half average of 563,000 bbl. daily (551,000 crude and condensate, 12,000 LPG).

Montreal refiners with insufficient Ontario capacity to supply markets west of the Ottawa Valley, or no Ontario capacity at all, went to work on products swaps and processing deals.

British American, Imperial, Petrofina, and BP said they had previously switched to Canadian sources or had made arrangements to do so. Exceptions were the imports of heavy fuel oil, specialty products, and distillate transfers to fill the gap in demand which Ontario refiners could not meet with a balanced operation.

However, efforts to shift Ontario supply lines resulted in little increase in the market for Canadian crude. Nonetheless, the companies involved—and the Canadian Government—are predicting declines in imports and Montreal transfers west of the Ottawa Valley.



LOCATION OF ESTABLISHED RESERVES of natural gas in Alberta. Source: Alberta Oil and Gas Conservation Board report, June 1961.

Trans-Northern Pipe Line Co. reports a decline in scheduled shipments through its 10-in. products system running westward from Montreal beyond Toronto to Hamilton, Ont. Trans-Northern, owned by Shell, Texaco, and British American, carries most of the product transferred from Montreal to the Toronto area.

Shell, with no Ontario refinery, and Texaco, having inadequate Ontario capacity to supply its markets in the province, account for more than half of the 50,000 bbl. daily of transfers west of Ottawa.

In one of the major results of the national oil policy, Shell recently announced plans to build a 31,000-bbl. refinery at Trafalgar, near Toronto, for completion in 1963. This development alone will go a long way toward assuring the long-term success of the program to displace foreign supplies in the portion of Ontario allocated to Canadian sources.

Shell had purchased the Trafalgar site with plans to build later in the 1960's. Its altered timetable will force a large capital investment ahead of schedule, and will leave idle capacity in Montreal until demand in that market area catches up.

Texaco last year completed a bottleneck-removal program that increased the capacity of its Port Credit, Ont., refinery from 20,000 to 26,000 bbl. daily. The company is studying the most economical means of furnishing increased volumes from Canadian sources to

back out its 16,000 bbl. daily of Montreal transfers.

With the Trans-Northern shipper-owners shifting supply sources, along with its two other shippers with no interest in the line (BP Petrofina), reversal of the line in 1963 seems assured. Then the line will pump westward only as far as the Ottawa Valley, with the possible exception of distillate movements in the winter. Markets between Toronto and the Ottawa Valley may be served by an eastward movement from Hamilton and Toronto.

Sun Oil, the last remaining crude importer in Ontario, has continued to bring 5,000 bbl. daily from Venezuela to its Sarnia refinery.

Almost without exception, the Canadian industry has expressed its intention to comply with the oil policy. Individual company forecasts furnished to the Journal bear out these intentions.

Meeting the targets. A combination of poor business conditions and an unscheduled shutdown of the Texaco refinery at Port Credit dropped domestic demand for Canadian crude in the first quarter below the corresponding period in 1960.

This bad start in Canadian demand was more than offset by the increased exports. And the requirement that production reach a level of 625,000 bbl. daily sometime during the first 6 months of the year was met easily.

Even so, the ambitious full-year production goal of 640,000 bbl. daily appeared at midyear to be unattainable. It would require a last-half average of 667,000 bbl. daily. Of all the major companies interviewed by the Journal, only one forecast production at the target level.

All expected the industry to come within 10,000 to 15,000 bbl. daily of the goal, with the consensus being a gain of about 87,000 bbl. daily over 1960. Barring a disruption of present crude-marketing patterns (such as loss of part of the Puget Sound market), most companies expect the 800,000-bbl. daily production goal for some time in 1963 to be reached during that year.

Role of governments. If the 1961 goal is not met, will Hees feel obliged to make good his threats of mandatory imports controls?

Considering the present production trend, plus the promise of further market expansion in Ontario, government action is believed to be out of the question. The National Energy Board, adviser to Hees on implementing the oil policy, is known to be pleased with industry response to virtually all aspects of the policy.

The trade and commerce minister also is gratified that the voluntary program is working so well. He has reason to be relieved that he apparently will not be forced to get involved in a complex mandatory controls program such as the U. S. resorted to when a voluntary program failed.

Although product transfers from Montreal west of the Ottawa Valley will be curtailed only slightly this year, the NEB appreciates that such shifts cannot be made overnight. Steps that have been taken thus far are concrete assurance that all major marketers are moving toward compliance.

Both the NEB and Hees appear

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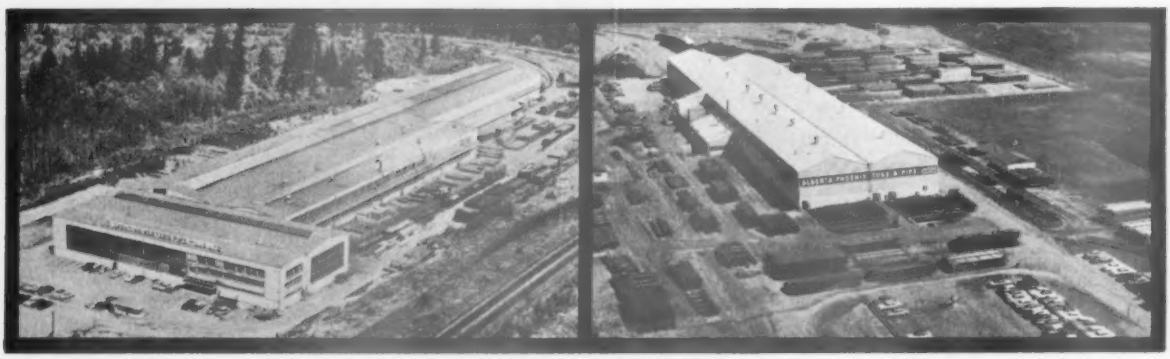

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willing to heed companies' urging that they look at the trend of shifting supply lines, and not at the short-term statistics, in judging the Ontario situation. They can regard the Shell refinery announcement as a major victory for their policy.

Reaction to the order to increase exports has been almost too good. The size and rapidity of the increase have been a surprise to the government, which has in fact used its influence temporarily to put the brakes on exports.

The National Energy Board has used private persuasion to delay further exports and thus avoid provoking Washington to crack down on imports from Canada and perhaps extend the quota system to this country.

When Hees announced the oil policy, he said the export phase would not abuse Canada's privileged position under the continental oil policy which exempts Canadian crude transported overland.

U. S. Secretary of Interior Stewart Udall commented: "Within the framework of the announced Canadian plan, the contemplated increase of imports of hydrocarbons—properly and orderly timed — should not materially affect oil production within the United States."

At the same time Udall warned: "If the Canadian plan has a marked and abrupt adverse effect on our petroleum industry, such action would undoubtedly furnish the basis for a review of the pattern of United States oil-import controls as they pertain to Canadian crude oil, condensates, and natural-gas liquids."

The Canadian policy envisions an increase equivalent to the estimated 10% demand growth in the 1,250,000-bbl.-daily refinery market in the northern states accessible by existing export pipelines. This year's projected export increase will be more than one-third of the 3-year total, amounting to about 50,000 bbl. daily.

Ottawa and Washington have established close liaison on the program, and Canada has reassured the U. S. of its intentions not to violate the spirit of the imports program. In conversations with a Journal reporter, officials of exporting companies and the Canadian Government expressed determination not to jeopardize their free access to the U. S. market. To do so would

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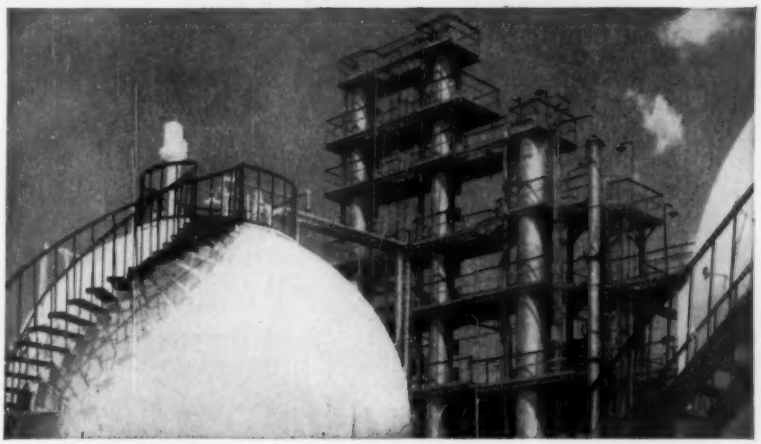

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assure the failure of the present oil policy and limit Canada's future expansion in a market that offers its greatest single opportunity for growth.

Canadian officials do not consider Chicago a proper market for any sizable volume of Canadian crude in the near future.

They would probably consider a major new export pipeline into a new market such as Chicago as a "maverick" proposal not in the best interests of the industry at this time. And any such project must be approved by the government on the advice of the National Energy Board.

The Alberta Conservation Board is in tune with federal officials on this point, as evidenced by its rejection of the proposed 75,000-bbl.-daily natural-gas-liquids pipeline from Alberta to Chicago.

The application of Interprovincial Pipe Line to extend its system from Hamilton, Ont., to Buffalo limits initial capacity of the 12-in. line to 20,000 bbl. daily. If Interprovincial should desire to add horsepower to expand capacity at a future date, it would have to return to NEB for approval.

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Ashland Oil & Refining Co., which is now buying 8,000 bbl. daily of Alberta crude, transported from an Interprovincial terminal by tanker to its Buffalo refinery, has guaranteed throughput of 10,000 bbl. daily for the proposed extension. However, Ashland's continued purchases of Alberta crude do not depend on NEB approval of the Hamilton-Buffalo pipeline.

Effects of oil policy. Besides increased revenue from the big gain in production for companies with western producing interests, the oil policy will have an impact on refining and marketing in the East.

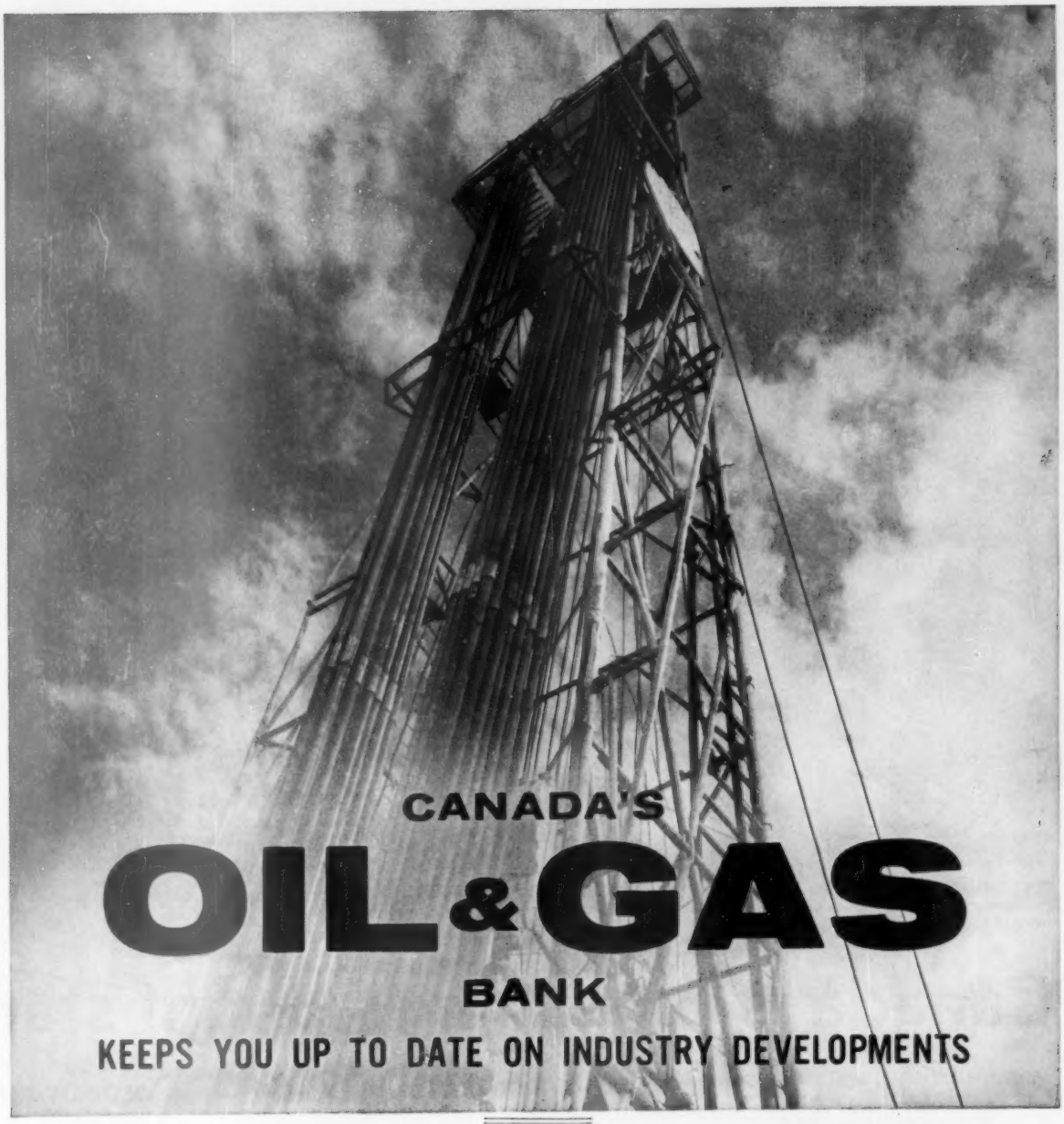
The effects in the East are mixed, however. For the marketer who has to switch from foreign to domestic sources in Ontario, there will be a penalty in his product costs. This has been estimated to be as much as 1½ cents a gallon.

When new Ontario refining capacity is built, considerable Montreal capacity—perhaps more than 50,000 bbl. daily—will be idle until absorbed by an increase in local demand. There has been some concern expressed that this situation would weaken products prices in Quebec.

On the other side, the Ontario refiner in a trading position has been able to obtain cheaper products for his Quebec markets. He should also be able to operate his refinery at a higher rate until capacity in the province is expanded. Ontario refiners have seen a possible firming of depressed products prices as their greatest benefit from the oil policy.

The oil policy will check the growth of imports over the next 3 years, although crude imports are scheduled to rise about 8% this year. Had it not been for the oil policy, it might have been imports—and not domestic production—that experienced the sharp increase.

At least two Ontario refiners with no capacity in Montreal were understood to be on the verge of importing sizable volumes of foreign crude. Using more expensive domestic crude, they said they could no longer compete with product from foreign sources. Forestalling this development may have been the biggest benefit of all for the western producer.



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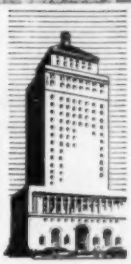

The Special Bulletins issued by this department are highly valued both by those already established in the industry and those planning to enter it. A list of these Bulletins, dealing with regulations, tariffs, financing, statistics, and related matters is available on request. Write The Royal Bank of Canada, Oil and Gas Department, 409 Eighth Ave. W., Calgary, Alta.

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CURVING PIPE being welded for Alberta-California System on west side of Livingstone Range in Alberta.

NATURAL-GAS-LIQUID RESERVES and both existing and approved pipelines for crude oil and natural gas liquids in Alberta.

Canada is pipelining's bright star

The Journal's pipeline editor here sizes up prospects for Canadian pipeline construction, which is riding high today

BY PAUL REED
Pipeline Editor

LARGE-SCALE pipeline construction in Canada comes in cycles. This year $126,250,000 is being spent on the Alberta and British Columbia sections of the Alberta - California system. From this high point, the Canadian oil and gas industries will be going toward another wave expected in about 2 or 3 years. Some of the work may start sooner.

Meanwhile approximately 800 miles of crude-oil and condensate lines starting this summer or later will be finished this year.

Three of these will change patterns of production-and-refinery relationships.

The Peace River Pipe Line Co.'s 161-mile, 12-in. crude-oil line now being built to Edmonton is important because of its connection for moving 15,000 bbl. a day of natural-gas liquids from the big Windfall gas-processing plant now being constructed. Connections at Edmonton facilitate shipment either through the Trans-Mountain or the Interprovincial trunk lines.

Hudson's Bay Oil & Gas Co.'s Rangeland Pipe Line Division's 41 miles of 4-in. and 8-in. from Pincher Creek area to connection with the Glacier Pipe Line will be first Canadian line to feed crude oil and condensate to Rocky Mountain refineries and be in a position to ship

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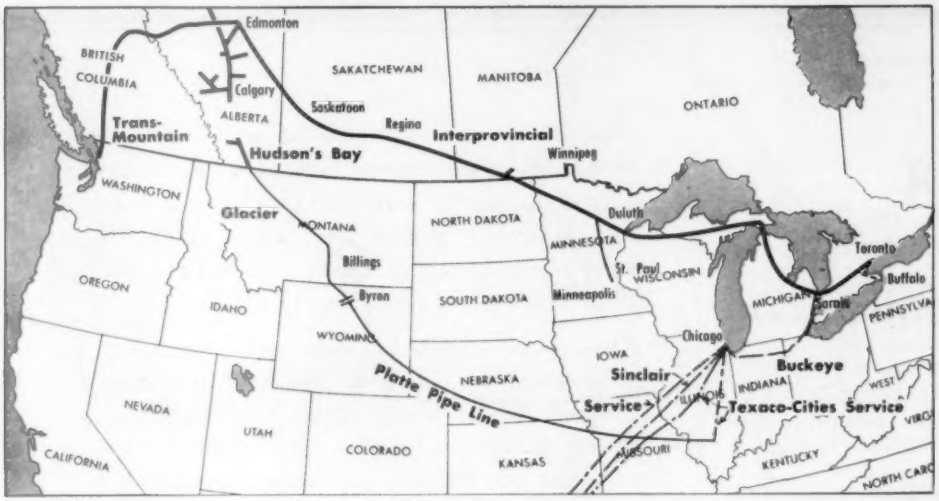

ROUTES for crude oil and condensate movements are indicated by existing and projected Canadian pipelines. From the U. S. border, Glacier Pipe Line goes to a connection with Platte Pipe Line which terminates in the St. Louis area. Lines to Chicago crossing Platte are indicated by dash-and-dotted lines. Another possible future access to Chicago is indicated by dashed line for section of Buckeye from Toledo.

eastward through the Platte Pipe Line.

Western Pacific Products & Crude-Oil Pipelines, Ltd.'s, 500-mile, 12-in. line will pipe crude oil and condensate from the recently developed Peace River Valley fields. British Columbia production in this area will thus be given its first access to refineries on Puget Sound. Consequently, some Alberta crude will be backed out of Puget Sound markets.

The form to be taken by future projects will be determined by several factors. Natural-gas lines could be affected by competitive situations in the United States and Mexico. Oil-line expansion will reflect developments in Canada's National Oil Policy.

Proposals, plans, and alternative possibilities are discussed separately for petroleum and natural-gas lines.

Since there has been more speculation recently on natural-gas liquids and how they will be pipelined, these will be dealt with first. This is appropriate because of their relation to both gas and petroleum pipelines.

Natural-Gas Liquids

In the immediate program for pipelining natural-gas liquids, attention is being given primarily to condensate. While some butane and propane may in some cases travel with it, these two products are diminishing in importance from a pipeline standpoint. On the other hand, the demand for pipelining condensate has been steadily increasing in recent months.

There are no proposals in sight for pipelining of propane which is expected to be produced in the next year or two only in sufficient volume to meet needs of Alberta and other western provinces. Propane will move to these markets largely by tank truck.

Butane. Because of the limited market demand for butane, its disposal is a problem. Processing-plant plans have recently shifted toward concentrating on condensate production. In some plants, production of propane and butane is being eliminated. And transportation prospects naturally follow this situation.

Propane. Transportation requirements for propane and butane could change with the growth of markets in the western provinces. The availability of ample supplies might stim-

BIG TRACTOR holding 36-in. pipe at the head of lowering-in operations. (Under the pipe a crane can be seen in valley below.) The work is on top of the Livingstone Range at section contracted by Majestic Contractors, Ltd. Construction photographs in Canadian section courtesy of Canadian Bechtel, Ltd.

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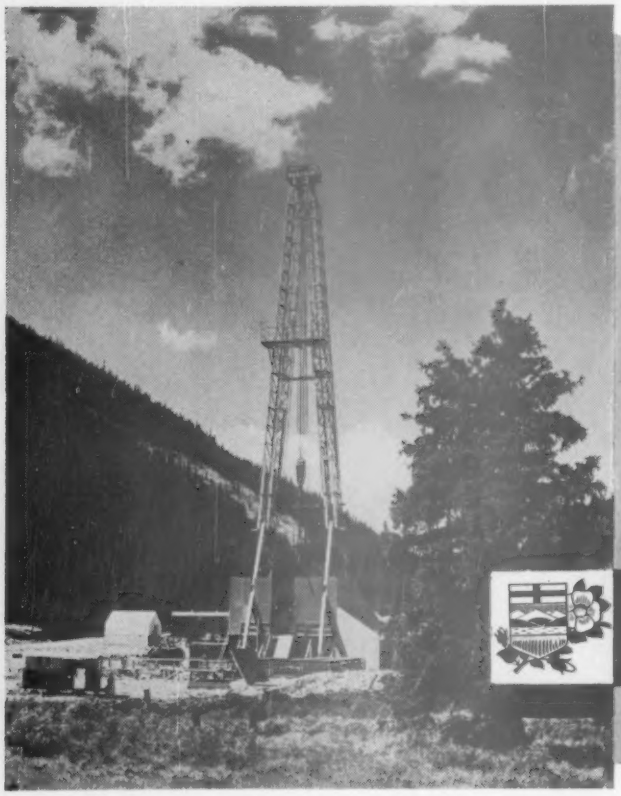

STILL PLENTY OF ROOM

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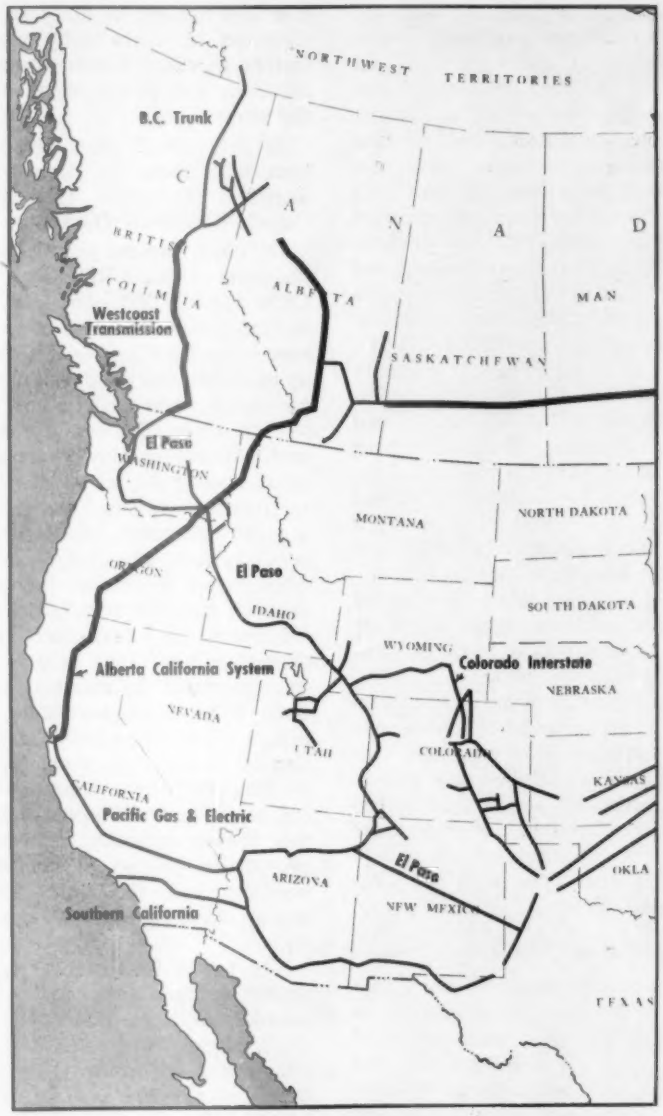


RELATION of Canadian gas export trunk lines to existing major systems in the western part of the United States.

ulate markets. Propane sales have been retarded by wide fluctuations, due to seasonal surplus and shortage. During last winter's shortage, propane was shipped from Oklahoma. Increasing use of butane would depend on growth of chemical industries in the prairie provinces.

The Province of Alberta has the right to require extraction of all natural-gas liquids from natural gas. But as a matter of practical policy it gives no indication of enforcing this right under existing conditions.

The Alberta Oil and Gas Conservation Board defines products discussed in this article in these terms:

... **Natural-gas liquids**—the liquid hydrocarbons recovered from separator treatment or processing of natural gas, including propane, butanes, and pentanes plus.

... **Pentanes plus** — a liquid-hydrocarbon mixture mainly of pentanes and higher hydrocarbons containing a small per cent of butanes and lighter hydrocarbons and includes natural gasoline and condensate.

... **Liquefied petroleum gas (LPG)**—propane or butanes or a mixture of propane and butanes.

... **Condensates**—a liquid hydrocarbon mixture mainly of pentanes and higher hydrocarbons recovered or recoverable by separator treatment of certain types of natural gas.

... **Dew point**—to meet the 15° F.-at-800-psi.-dew-point requirement of the gas export lines all of the condensate and some of the butane must be removed.

The remaining butane and propane can be left in the gas stream. Trans-Canada minimum requirement is 950 B.t.u. For gas between 1,000 and 1,125 B.t.u., Trans-Canada gives a credit for additional B.t.u.'s. As much as 1½ gal. of butane and propane can be carried in 1 M.c.f. of gas.

Since this does not raise the price paid by Trans-Canada's customers, the extraction of LPG at a plant in eastern Canada has been discussed as a possibility.

Butane extracted at field processing plants is often mixed in crude-oil streams. Mixtures reported are 2% butane in crude. Refiners restrict butane content to suit their needs. Flaring is prohibited except in emergency situations. To avoid flaring, it could be expected that excess butane will be returned to the formation.

Condensate. The status of condensate has become entirely different from that of butane. Sometimes designated as pentane plus, it is in the heptane-hexane range, 50° to 70° API. Most desired by refiners are the heavier condensates in the 50° to 60° range.

From appearing as a surplus product in 1957 when more was stored in Alberta than was moved to market, condensate has grown in favor to the point where it now sells at the highest crude-oil prices, the same as for 42°-44°-API crude. It has no posted price and is not prorated. Average gravities of Alberta crudes are in the 30°-35° API range.

Proration of condensate could be considered in the future if its effect would be seriously disrupting to the crude-oil-production business. Cycling operations at condensate-producing gas fields are just beginning in Alberta. They will increase. In regulating cycling operations, the conservation board could exert a type of proration through requirements for the amount of condensate to be returned to the formation. Such a return would reduce the amount of condensate going to pipelines. But for the present no such proration is in prospect.

Access to market. By a natural

right—though not by specific legal regulation—condensate is pipelined with a priority over crude in lines going out of Alberta. Monthly crude-oil proration is determined after condensate and natural gasoline have been deducted from the total of refinery nominations of requirements. So condensate now has unlimited access to markets.

Furthermore, refinery preference for condensate is indicated by increasing amounts specified in monthly nominations to Alberta.

Since the first of the year, condensate shipment through export lines has risen.

Although these shipments include some condensate extracted in field separators in crude-oil production, most of the condensate reported is from gas-processing plants.

1962 Movements

Estimated Alberta daily condensate and natural-gasoline production of 11 gas plants for 1962, totaling 30,950 bbl., grades of product, and means of transportation where known are as follows:

Calgary plant, 1,850 bbl., heavy condensate, Cremona Pipeline; Carstairs plant, 2,200 bbl., heavy condensate, trucked to refinery at Innisfail; Crossfield plant, 1,200 bbl.; Harmattan-Elkton plant, 4,000 bbl., medium condensate, Harmattan-East plant, 1,000 bbl. medium condensate and Nevis plant, 1,000 bbl., natural gasoline—these plants deliver to Rangeland and Texaco Exploration pipelines shipping to Edmonton and also by truck to Calgary; Pembina plant, 1,000 bbl., natural gasoline only, Britamoil pipeline; Pincher Creek plant, 5,000 bbl., heavy condensate, and Waterton plant, 2,000 bbl., heavy condensate — both to Hudson's Bay pipeline for shipment south; Westerose plant, 4,600 bbl., medium-light condensate; Homeglen-Rimbey plant, 3,300 bbl., medium - light (62° API) condensate, Britamoil pipeline; Windfall plant, 10,000 bbl., heavy (58°-62° API), Peace River pipeline to Edmonton.

Condensate now has the legal status of crude oil and therefore is exempt from the restrictions imposed when the Pipeline Act of 1958 designated condensate from gas plants as a natural-gas liquid. The amendment to the act which became law at its third reading in the Alberta Legislature on April 16, 1961, stated that condensate is now considered to have the status of crude oil and is not now classed with butane and propane in the natural-gas category. Federal confirmation of this status of condensate is expected in the passage of Bill C-113 in the Dominion House of Commons which has passed its first reading. Permits for lines for natural-gas and legally classed natural-gas liquids are granted under more stringent conditions than for crude-oil lines.

For natural-gas lines, permits are granted after hearings and recommendations by the Alberta Oil and Gas Conservation Board. Hearings are not required for crude-oil lines and permits are customarily granted by the Department of Mines and Minerals as a matter of routine unless the board expresses objection.

The new legal status is expected to facilitate pipelining the increasing flow of condensate from gas-processing plants to refineries.

Until recently, it has been a common practice to batch condensate out of Alberta. Now the trend is toward mixing with the crude stream.

No obstacles are in sight to impede the pipelining of condensate either in the crude-oil streams of existing trunk lines or in new lines for handling it.

Existing vs. New Trunk Lines

The existing crude-oil trunk lines provide the most practicable means for long-distance transportation of condensate. The Alberta Oil and Gas Conservation Board decided that it would not be feasible to plan for a 16-in. line proposed by Standard Oil Co. (Ind.) from Alberta to Chicago. The reason given was that the project would be uneconomic. At best there would be available in 1965 only 45,000 bbl. per day. Some 50,000 bbl. would be needed for financial requirements and for reasonable tariffs. After pointing this out, the board recommended rejection of the proposal.

Even if economically feasible, the board did not consider it good policy to concentrate Alberta condensate deliveries on such a scale at one refining center such as Chicago.

Crude Oil and Condensate

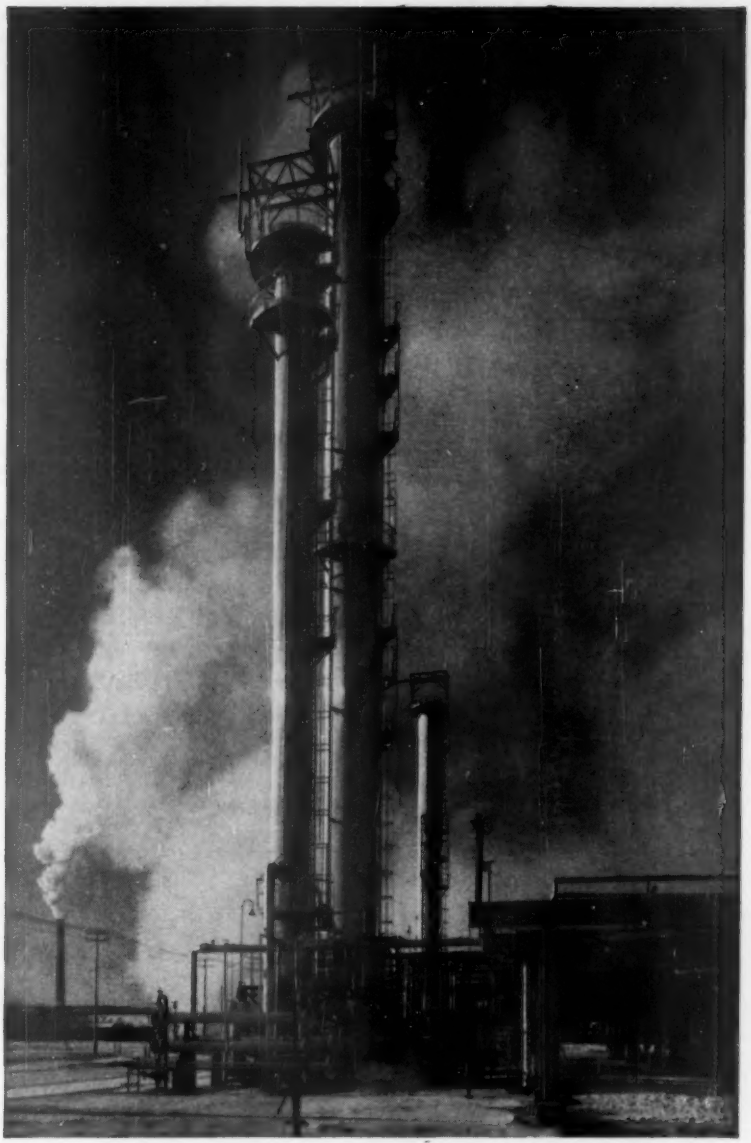
New trends are indicated by some of the new crude-oil and condensate lines under construction between now and the end of the year. Patterns set by them will influence further pipelines feeding from the oil fields and processing plants to the trunk lines.

In the next 2 years, the trunk lines must meet the demands for increased throughput required by Canada's National Oil Policy.

Of much present significance is the effect of Peace River Pipe Line Co.'s $10,000,000, 161-mile, 12-in. crude-oil and condensate line now being built primarily to move up to 15,000 bbl. per day of natural-gas liquids from the Windfall plant to Edmonton. The initial capacity of 40,000 bbl. per day also provides an alternative way of moving crude oil from the Sturgeon Lake area. By a rapid succession of moves, the company took advantage of a dormant permit to prepare for piping products from the Windfall plant to Edmonton for transportation through either Trans Mountain or Interprovincial. By thus routing the large Windfall condensate production, it was removed from consideration for possible shipment through the formerly proposed Dakota-Eastern 16-in. line to Chicago. Loss of this volume seriously reduced the prospective volume of condensate needed to make the Dakota-Eastern line an attractive economic possibility.

The export line that was recommended in June by the conservation board is Hudson's Bay Oil & Gas Co.'s 41-mile, 4-in. and 8-in. line with initial export of 10,000 bbl. daily and ultimate capacity of 31,000 bbl. By connections through a short line of Aurora Pipe Line Co. at the border joining with the new Glacier Pipe Line Co. (owned by Continental Oil Co. and Texaco Inc.), access from Canada is given for delivery via Glacier to the Billings, Mont., refining center. A Glacier connection at Byron, Mont., with Platte Pipe Line opens the way to St. Louis and thence via other lines to Chicago. Early shipments through the lines are scheduled to go only to Billings, Mont. The project is in accord with policy of the conservation board to encourage pipeline outlets from Alberta into the western and central areas of the United States.

The board recommended that British American Oil Co. use this Hudson's Bay line so as to move its



Towers for Texaco

When it comes to producing vessels of this kind, experience on the part of the fabricator is a great asset to the main contractor. To have a fully equipped plant is not enough. There must also be a very advanced knowledge of the actual techniques of steel fabrication. New materials and procedures are always being developed and to reap the benefits, they have to be properly applied.

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DOMINION BRIDGE COMPANY LIMITED - FIFTEEN PLANTS COAST-TO-COAST IN CANADA

condensate southward from the Pincher Creek area rather than to move it northward through the Britamoil line it proposed to build to deliver its products to its refinery at Calgary.

Britamoil Pipe Line Co., Ltd.'s, (subsidiary of British American Oil Co., Ltd.) 60-mile, 8-in. line from the Rimbey gas plant to the British American refinery at Edmonton is intended primarily for moving condensate but would be available for propane and butane shipment if required. Capacity with one pump station would be 32,000 bbl. per day; with two stations, 44,800 bbl. per day.

Although the Alberta Conservation Board declined to recommend Britamoil's proposal to build a 120-mile, 6-in. line from the British American Pincher Creek gas plant to the British American refinery at Calgary, it would seem reasonable to expect that eventually the province would authorize construction of such a line for handling the flow of condensate such as now goes between the two British American plants by tank car.

Royalite Oil Co. Ltd.'s 26-mile, 4-in. line, with 3,600-bbl. per day capacity, will connect the company's plants at Wildcat Hills and Jumping Pound.

Integrated Grid-System Possibilities

An integrated pipeline system for the complete gathering and local distribution of natural-gas liquids is not practical for the province, in the opinion of the board.

While surpluses of natural-gas liquids will develop, the volumes can be handled by existing facilities and certain new separate lines, without resorting to a separate integrated system.

Propane and butanes, in the board's opinion, can be handled by rail and truck and a few special lines. Condensate can be satisfactorily carried partly by crude-oil lines and partly by special separate lines.

Expansion Prospects for Existing Petroleum Lines in Alberta

Texaco Exploration Co.'s crude and condensate line from Bonnie Glen to Calmar, near Edmonton, is operating close to capacity. When fully powered, the conservation board believes it would not reach saturation of capacity until 1964 or 1965. All of the other existing petroleum lines, if powered to ultimate capacity, could move available butane and pentane plus in the lines to Alberta markets or to major trunk lines until 1968 or 1970.

None of the petroleum lines in the province are now operating at capacity.

On the Texaco line, further extensive looping would be required in 1965 to 1968, even if additional pumps were added. This extra capacity would be needed to handle crude oil from existing fields plus anticipated butane and condensate production.

Condensate now produced at the Rimbey plant goes to Edmonton through the Texaco line. Propane and butane are shipped from there to markets by truck and rail.

Excess Trunk-Line Capacity

Trans Mountain is regarded by the board as capable of moving 11,000 to 13,000 bbl. per day of surplus pentanes to the Pacific Coast until 1968 or 1969. For movement of 17,000 to 20,000 bbl. per day to eastern markets, expansion of capacity would be required earlier.

Interprovincial appears to have ample capacity for needs until 1963. This would be as early as Interprovincial would need to prepare for its part toward the 800,000-bbl. per day goal set by the National Oil Policy.

With the 225,000 bbl. per day throughput in July 1961, Interprovincial still has surplus capacity of 103,000 bbl. per day at Regina, Sask.

For a 65-mile, 12-in. lateral to Buffalo, N. Y., Interprovincial is seeking a permit from the National Energy Board. Capacity to start would be 10,000 bbl. per day and later 20,000 bbl. per day.

Imports into the Detroit-Toledo area from Interprovincial via Buckeye are now 25,000 to 30,000 bbl. per day. Buckeye is not now being used to transmit Canadian crude to Chicago.

Discussion has been suspended on earlier proposals to ship oil from Interprovincial to Chicago either by a connecting pipeline or by barge shipments from Superior, Wis.

A challenging proposal to facilitate the national 800,000-bbl. per day goal for 1963 is the Independ-

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ent Pipe Line project sponsored by R. A. Brown, president, Home Oil Co., Ltd. This calls for a $430,000,000, 2,100-mile, 34-in. crude-oil line from Alberta to Montreal. Throughputs would increase to 598,000 bbl. per day in 1971. Initial cost of service has been estimated at 74.0 cents per barrel; in 1965, 48.9 cents, and in 1971, 34.8 cents. A tariff of 50 cents per barrel has been proposed with the expectation of generating sufficient earnings to attract the necessary capital.

The Western Pacific Products & Crude Oil Pipelines, Ltd., $35,000,000, 505-mile, 12-in. crude-oil and condensate line from Taylor, B. C., in the Peace River Valley to Kamloops, B. C., will provide for flows of British Columbia production to Puget Sound which would supplant Alberta oil. This line scheduled for completion this fall will deliver at a connection with Trans Mountain. Western Pacific, an affiliate of Westcoast Transmission, will use Westcoast right-of-way.

Natural-Gas Pipelines

After 3 years, the steady increase in demand for natural gas from Alberta will call for pipeline construction for a 5-year period (1964 or 65 until 1970) amounting to an equivalent of 1,200 miles of 34-in. pipe for systems outside the Province of Alberta. This is based on the forecast of Dr. G. W. Govier, chairman of the Alberta Oil and Gas Conservation Board. This work will be in the form of loops or completely new systems.

Inside Alberta, the Alberta Gas Trunklines Co., Ltd., would be expected to start an expansion of its system each year to handle growing deliveries of about 150 to 200 M.M.c.f. annually. This means that after 1964 or 1965, there will be the equivalent of 120 to 160 miles of 20-in. pipe laid for this system. These will include extensions and loops.

Meanwhile, according to Dr. Govier, gas-pipeline construction, within Alberta until 1964 or 1965, is likely to be only for lateral lines for the existing two divisions of the Trunk Lines system serving TransCanada and the southward outlets identified with the Alberta - California system. Such new lateral lines would be the equivalent of about 230 miles of 18-in. pipe.

These estimates just given concern only those for lines inside and outside of Alberta transmitting Alberta gas. They do not include the particular lines of Westcoast Transmission planned for handling British Columbia gas.

Westcoast's Expansion

Westcoast Transmission has plans for several large projects. The first one is a 41.3-mile line consisting of 38.6 miles of 12-in. and 2.7 miles of 16-in. for transmitting gas from Worsley field in Alberta to Westcoast's facilities in Boundary Lake field at the British Columbia border. This line from Worsley would be built by Alberta Gas Trunk Lines.

Hearing was held June 26 by the conservation board. Pipe laying is due to be under way in September. The lines should be ready for operation in November.

This line would be added to the schedule of the present permit to increase by 90 M.M.c.f.d. average. This would amount to a total of 1.08 trillion cubic feet up to De-

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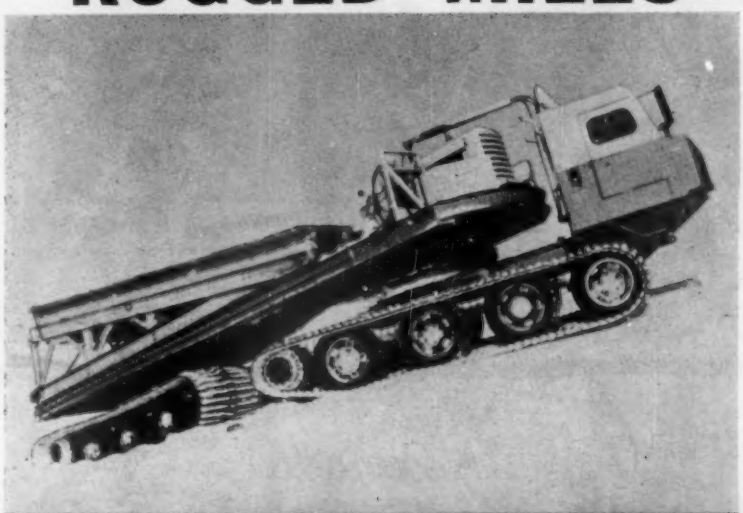

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cember 31, 1979. Present peak is 56 billion per year. The project must be approved by the Canadian Energy Board. To date only 95 billion cubic feet has been removed.

Connections for this project on the British Columbia side of the border calls for 4 miles of 16-in. to be laid by Gas Trunkline of British Columbia, Ltd. At the border itself a 1-mile, 16-in. line would be built. Sweet gas is produced in the Worsley field. Shell will remove the liquids. This will be the second gas line to cross the Alberta-British Columbia border.

A second Westcoast undertaking would be to add to present facilities along the Alaskan Highway. A $2,800,000 41-mile project would include a 24-mile, 16-in. line to Beg gas field and a 17-mile, 12-in. line to North Jedney, B. C. This would be for Gas Trunkline of British Columbia, which would deliver for Westcoast account. The project is contingent on completing arrangements for contracting gas production. It is scheduled for completion in November.

A 52-mile line consisting of 28 miles of 16-in. and 24 miles of 24-in. from Nig Creek to Laprise Creek will be started September 12 and completed October 18.

The only pipeline construction now going on for Westcoast is in southern Alberta, from Savannah Creek gas field to the Coleman gas plant. It is known as the Southern Alberta project, undertaken by Saratoga Processing Co., owned 25% by Westcoast. It is 44 miles of 16-in. now being laid.

Gas from this project is likely to be the first available for the Alberta-California system. Volume will be 50 million cubic feet of the total 150,000,000 cu. ft. per day for the system.

A third project—the Fort Nelson line—is in its first stage after being approved by the British Columbia government. Its materialization is contingent on marketing the gas and developing reserves. National Energy Board approval must be given for increasing the gas to be exported.

Timing of construction would not be earlier than 1962 for gas movement to start late in 1962 or in 1963. The prospects are that construction will not be later than 1963 for gas movement in 1963 or 1964.

It calls for 245 miles of 30-in. from Fort Nelson, B. C., to Station No. 2 near Chetwynd, B. C. Cost would be $54,000,000 including treating and dehydrating plant costing $11,000,000 and gathering lines costing $1,000,000. For moving the scheduled 250 M.M.c.f.d., no compressor station is included.

The second stage of the Fort Nelson project would be to bring capacity to 450 M.M.c.f.d. by the addition of 11,000 compressor horsepower. These together with treating-plant and gathering system facilities would cost $28,000,000. Included in the cost is $11,000,000 for additional gathering system needed for the second stage of the Fort Nelson project.

The two phases of the Fort Nelson project together would cost a total of about $90,000,000.

The third and next step for the Fort Nelson project would be the addition of three more stations to bring capacity from 450 M.M.c.f.d. in 1961 to 650 M.M.c.f.d.

Trans-Canada

A program for expansion of capacity is indicated by Trans-Canada Pipe Lines, Ltd.'s, application to the National Energy Board for permission to add 53,760 compressor horsepower at seven stations west of Lake Superior. Total cost of these compressor installations is estimated to be $8,643,400.

The first six are between the western end of Saskatchewan and a location near Winnipeg at a junction with the 50-mile lateral to Emerson, Man., where it connects with the Midwestern Gas Transmission Co. line to Wisconsin. The seventh station is in the Port Arthur, Ont., area. These compressors would implement a 200,000,000-cu.-ft. per day increase in capacity to become effective probably late in 1962. Some looping may be considered for the section of the line west of Winnipeg.

The seven compressor stations include five gas turbine units. Their available horsepower, approximate locations and costs are as follows:

9,660 hp., Station 5, Cabri, Sask.	$1,438,400
9,580 hp., Station 9, Herbert, Sask.	1,438,400
9,770 hp., Station 17, Regina, Sask.	1,438,400
9,680 hp., Station 21, Grenfell, Sask.	1,406,300
10,070 hp., Station 34, Portage La Prairie, Man.	1,376,100

There will also be two 2,500-hp. engine units, each costing about $772,900. One will be at Station 41, Ile des Chenes, Man., and the other at Station 68, Port Arthur, Ont.

All of the seven units are to be added to existing one-unit stations.

Alberta-California System

On the Alberta-California system being completed this year to San Francisco, there will be four initial compressor stations, totaling 40,000 hp.

To bring throughput up from initial design capacity at the International border of 570 to 800 M.M.c.f.d. delivery to Pacific Gas & Electric Co., and 303 M.M.c.f.d. to El Paso Natural Gas Co.—total of 1,103 M.M.c.f.d.—future compressor requirements will total 258,000 installed horsepower at 16 stations.

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WAREHOUSE, shop and field office serving maintenance and operation work on the Alberta Gas Trunk Line Co. system transmitting all the natural gas exported from Alberta.

Alberta Gas Trunk Line has unusual status and functions

BY PAUL REED
Pipeline Editor

PIPELINING of gas for export in the Province of Alberta begins and ends in the system of Alberta Gas Trunk Line Co., Ltd. The unusual status and functions of this company are major factors in the gas industry of the area since all gas exported from the province must go to the borders through this network.

The company is like no other. For it has been devised to handle gathering and transmission with a type of organization aimed at safeguarding the diverse interests of producers (and processors), utilities, export pipelines, and the province. In operation it is charged with responsibility for maintaining inspection standards to insure that gas from producers be delivered to exporters according to specifications.

Facilities and Investments

Volume transmitted in the middle of this year is approximately 643 M.M.c.f.d. In 1962 the average is expected to be 1,330 M.M.c.f.d. By the end of this year Trunk Line will have a total mileage of nearly 1,100 miles of pipe ranging from 4 to 36 in. representing a total investment of $155,250,000. Of this amount approximately $84,290,000 will be spent on 350 miles of 30 and 36-in. main line and 180 miles of 12 to 22-in. laterals to deliver to the Alberta California system being completed this year.

The previous existing 613 miles of 4 to 34-in. lines deliver mostly to Trans-Canada Pipe Lines, Ltd. To this is being added in 1960 and 1961, 82 miles of 24-in. and 172 miles of 4-16-in. not included in the total mileage for the system mentioned in the paragraph above.

Unusual Organization

Contrary to a common belief Trunk Line is not a government organization—not a crown corporation. Neither was it introduced for incorporation as a private bill. On April 8, 1954, it was incorporated by legislation sponsored by the government of Alberta. An outline of the unusual corporate details helps in understanding the operation of the company.

How Controlled

Complete control rests in a board of seven directors as in an average corporation. These represent four groups holding 925 shares of Class B nonvoting stock, transference of which is restricted:

Group	Shares issued	No. of directors
1. Utility companies	97	1
2. Gas exporters	8	1
3. Gas producers and processors	817	3
(Total of elected directors)		5
4. Lieutenant governor in council of Alberta appoints two directors qualified by two shares owned by the government	2	2
	924	7

Election of directors representing Groups 1, 2, and 3 is determined by the voting of shares specifically designated to each of these groups for electing the particular director or directors to represent it.

Safeguarding of interests. The government owns 85% of the mineral rights of the province. The government-appointed directors cannot be members of the government of Alberta or of government services. Every director must be a Canadian and a resident of Alberta for at least 1 year. No contract or agreement can be made which could lead to control of Trunk Line by an export line company. Furthermore, by its very nature, the status of Trunk Line as a whole is a protection against encroachment of federal control.

Since Trunk Line operates entirely within the province, rates cannot

THE PIPELINES of Alberta Gas Trunk Line Co., Ltd., have two principal systems, one delivering to Trans-Canada Pipe Lines, Ltd., the other to the Alberta-California System.

be dictated by the federal government.

Provision has been made in the export permits issued by the Alberta government to assure that sufficient gas be available for emergency needs of Alberta utilities.

Financing. Trunk Line is publicly financed according to the familiar pattern for pipelines, with 75% debt and 25% equity in common, preferred, and accumulated surplus.

Stock was issued in 1957. In 1962 the company will be in a position to consider declaration of the first dividend.

Sphere of action. Not law but custom is the basis of authority by which Trunk Line has the exclusive right to move export gas to the borders of Alberta. It works this way. Generally no permit to export gas would be issued by the Department of Mines and Minerals unless the gas were to go through Trunk Line to the export line.

Cost of service. Rates are negotiated between Trunk Line and exporters according to a cost of service calculated each month for operating expenses, taxes, and an annual rate of return of 7½%. (Depreciation of line facilities is 4%.)

A flat rate of 4 cents per M.c.f. has been charged to Trans-Canada during the first 4 years of operation.

Estimated rates for Trans-Canada are exemplified by the following for years ending on September 30:

Name of division	Year	M.M.c.f.	Throughput costs, cents per M.c.f.
Plains	1961	233,877	3.86
	1965	434,788	3.08
Foothills	First year	217,010	5.55

A flat rate of 2 cents per M.c.f. is paid for small quantities of gas transmitted to certain utilities in the province.

Standards and Requirements

Trunk Line does not process or remove gas in transit to the export lines. Gas is measured at 60° F. and at 14.4 psia. Specific gravity at receipt and delivery points are determined by gas gravitometer. Not more than 1 grain of hydrogen sulfide per 100 cu. ft. and not more than 20 grains of total sulfur per 100 cu. ft. are permitted. Nor more than 2% by volume of carbon dioxide.

Dew-point requirements specify that gas not contain hydrocarbons or carbon dioxide liquefiable at temperatures higher than 15° F. at 800 psi. Gas accepted into the line must be free of dust and gum.

Water-vapor content must not be more than 4 lb. per M.M.c.f. measured at 14.4 psi. and 60° F. This compares with water-content requirements of 6, 8, and 10 lb. of certain gas lines in the United States.

Gross heating value determined by calorimeters must not be less than 975 B.t.u. per cu. ft., according to contract terms.

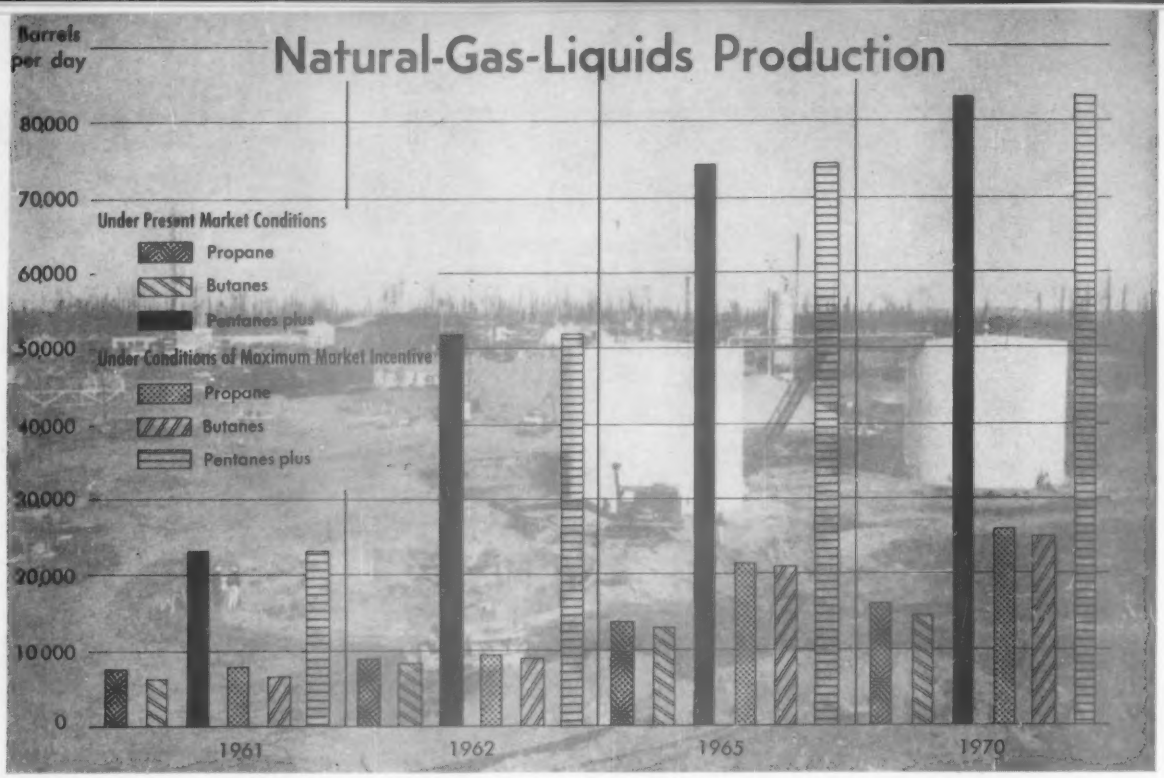
The dew point of 15° F. at 800 psi. has proved to be adequate. Ground temperature in the system does not drop below 28° F. At two of the four drips on the system—blown twice a month—no liquids have been found. At the other two drips only a small—almost negligible—amount has been caught.

Attention is given by Trunk Line to providing tools and facilities to meet standards of excellence in maintenance.

Compressors

The first compressor equipment is being installed this year—3,400 hp. costing $2,700,000 at Princess station in the Plains Division. Additional horsepower for 1962 has not yet been determined. So far 780 M.M.c.f.d. has been transmitted through a 34-in. line without Trunk Line compression.

Although large future expansion of the Trunk Line system within Alberta is expected, estimates of facilities cannot be made until requirements of exporters are shaped up.



Growing pains are afflicting Canada's flourishing gas-processing industry

Approval of exports to U. S. was a shot in the arm, and the industry is expected to double in capacity in next 2 years

BY HUGH S. PYLANT
Petrochemical and Gas-Processing Editor

PROSPECTS for Canada's fast growing natural-gas industry were brightened considerably by recent approvals of large-scale gas exports to the U. S. These exports, added to a growing domestic demand, will require the gas-processing segment of the industry to almost double its capacity in the next 2 years.

Information gathered from industry and government sources in Canada indicates the future of natural gas and gas processing to be as follows:

...Canadian consumption of natural gas will grow from 335 billion cubic feet last year to around 420 billion this year and will probably more than double to 870 billion by 1970.

TABLE 1—DEMAND FOR CANADIAN GAS
(Billion cubic feet)

	1960	1961	1962	1965	1970
Quebec	10	30	35	60	90
Ontario	100	130	160	220	305
Manitoba	10	15	20	25	35
Saskatchewan	25	30	35	40	55
Alberta	150	170	180	210	255
British Columbia	25	30	35	80	95
Fuel, losses, etc.	10	15	15	25	35
Total domestic	335	420	480	660	870
Export to U. S.	115	200	330	330	330
Possible additions	....	....	....	250	550
Total possible demand	450	620	810	1,240	1,750

TABLE 2—ESTIMATED GAS-PROCESSING CAPACITY AND INVESTMENT

	1960	1961	1962	1965	1970
Capacity (M.M.c.f.d. of residue)	1,950	2,700	3,100	4,500	5,600
Investment (millions of dollars)	160	245	280	380	485

GAS-CONSERVATION PLANT of British American Oil Co., Ltd., at Nevis, Alta., is undergoing $1,500,000 expansion.

... **Exports** to the U. S. hit 115 billion cubic feet in 1960, will reach 200 billion in 1961, and 330 billion and possibly as much as 880 billion by 1970.

... **Gas-processing facilities** are being increased from a total capacity last year of 1,950 M.M.c.f.d. to 2,700 M.M.c.f.d. by the end of 1961, and should reach an estimated 5,600 M.M.c.f.d. by 1970.

... **Investment represented** by gas-processing facilities will climb from $160 million to $245 million during 1961, and could go as high as $485 million by 1970.

... **Byproduct production** from natural-gas processing amounted to 8,400 bbl. per day of LPG, 16,500 bbl. per day of natural gasoline and condensate, and 1,200 tons of sulfur daily during 1960. For 1961, this is estimated to be 13,700 bbl. per day of LPG, 23,900 bbl. per day of natural gasoline and condensate, and 1,500 tons of sulfur per day. Under the present market incentives, 1970 daily production is estimated at 33,200 bbl. of LPG, 83,300 bbl. of natural gasoline and condensate, and 8,900 tons of sulfur. If market conditions improve to the extent that maximum recoveries are economical, LPG production could be increased to around 50,990 bbl. per day. There should be no appreciable change in the production of natural gasoline, condensate, and sulfur.

Natural Gas

Demand for Canadian gas totaled 450 billion cubic feet last year and estimates are that it will top 620 billion feet for 1961. The outlook for 1965 indicates at least a 50% increase over 1961, and possibly more as further exports are approved. Provincial and export commitments for selected years between 1960 and 1970 are shown in Table 1.

Reserves to support further exports are already available. Alberta alone, at the end of last year, had surplus disposable gas reserves of 8.1 trillion cubic and this surplus is expected to increase to about 50 trillion cubic feet by 1990. All

SHORT-CYCLE ADSORPTION plant, built by Black, Sivalls & Bryson, Inc., is typical of much construction in Alberta.

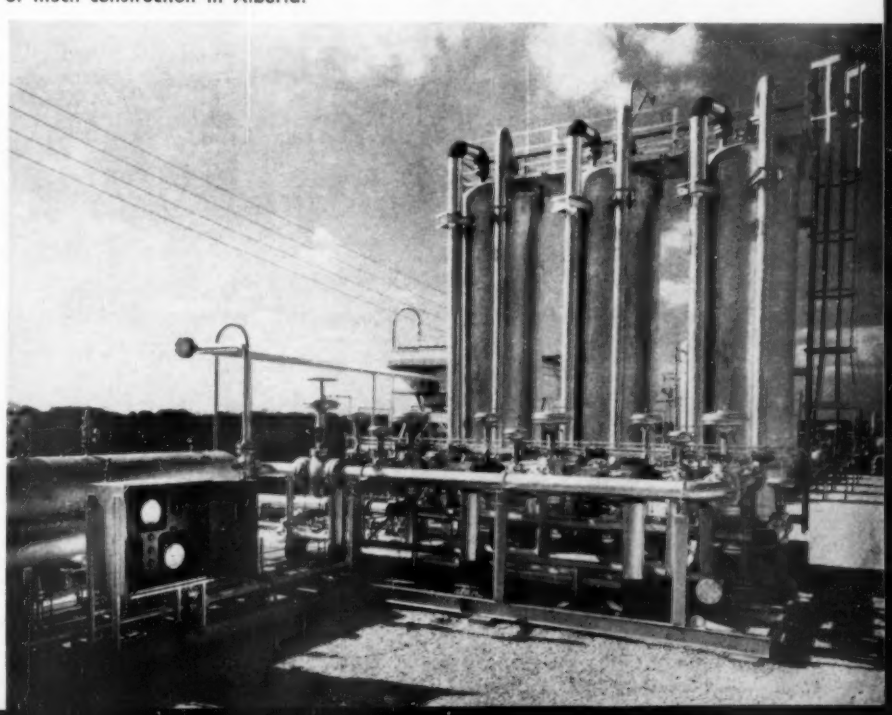


Table 3—Natural-gas-processing plants in western Canada, December 1960

Plant operator and location—	Residue gas cap. (M.M.c.f.d.)	Type plant	Investment ($1,000)	Propane	Butanes	Natural gasoline	Cond.	Sulfur
Ajax Processors Ltd., St. Albert, Alta.	20	Abs.	655	..	..	X	..	..
Amurex Oil Co. Ltd., Princess, Alta.	2	Ads.	33	..	..	..	X	..
Anglo American Exploration Co.								
Turner Valley, Alta.	9	Abs.	500	..	X†	X	..	..
British American Oil Co. Ltd.								
Gilby, Alta.	14	Ads.	174	..	..	..	X	..
Nevis, Alta.	45	Abs.	6,600	X	X	X	..	X
Pincher Creek, Alta.	145	Abs.	29,330	X	X	..	X	X
Westerose South, Alta.	280	Refrig.	12,000	X	X	..	X	..
California Standard Co.								
Cessford, Alta.	12	Ads.	87	..	..	..	X	..
Nevis, Alta.	43	Refrig.	2,850	..	..	..	X	..
Princess, Alta.	12	Ads.	470	..	..	..	X	..
Canadian Chieftain Petroleums Ltd.								
Provost, Alta.	10	Ads.	192	..	..	..	X	..
Canadian Oils Ltd.								
Innisfail, Alta.	8	Abs.	2,450		(Stabilized crude-oil product)			X
Canadian Pacific Oil & Gas, Hussar, Alta.	20	Ads.	151	..	..	..	X	..
Canadian Superior Oil of Calif.								
Harmattan-Elkton, Alta.*	12	Compr.	1,456	..	..	..	X	..
Canadian Western Natural Gas Co.								
Carbon, Alta.	65	Expansion	215	..	..	..	X	..
Canex Gas Co.								
Cessford, Alta.	21	Ads.	105	..	..	..	X	..
Sedalia, Alta.	5	Ads.	39	..	..	..	X	..
Caney Gas Ltd., Wood River, Alta.	5	Ads.	38			(Negligible)		
Cankee Gas, Cessford, Alta.	22	Ads.	247	..	..	..	X	..
Goliad Ltd., Pembina, Alta.	78	Refrig.	11,270	X	X†	X	..	..
Home Oil Co., Carstairs, Alta.	66	Refrig.	3,570	..	..	..	X	..
Honolulu Oil Corp., Three Hills Creek, Alta.	5	Ads.	107	..	..	..	X	..
Hudson's Bay Oil & Gas Co.								
Cessford, Alta.	120	Refrig.	1,084	..	..	..	X	..
Oyen, Alta.	4	Ads.	60	..	(†)	..	X	..
Imperial Oil Co. Ltd.								
Chigwell, Alta.	8	Ads.	94	..	..	X	..	..
Devon, Alta.	24	Refrig.	4,963	X	X	X	X	..
Golden Spike, Alta.	14	Compr.	2,800		(Fractionation of products at Devon plant)			
Nottingham, Sask.	7	Ads.	2,200	X	X	X	..	..
Redwater, Alta.	10	Refrig.	2,200	X	X	X	..	X
Smiley, Sask.	3	Refrig.	750	..	..	..	X	..
Jefferson Lake Petrochemicals, Taylor, B. C.¶	..	Claus	3,000	..	..	..	..	..
Kerr-McGee Oil Industries, Prevo, Alta.	5	Ads.	75	..	..	..	X	..
Mid-Western Industrial Processors								
Alexander, Alta.	50	Refrig.	220	..	..	X	..	..
Okalta Oils Ltd.								
Princess, Alta.	4	Ads.	35	..	..	..	X	..
Pacific Petroleums Ltd., Taylor, B. C.§	300	Ads.	35,265	X	X	..	..	X
Pan American Petroleum Corp.								
Windfall, Alta. (gas cycling pilot project)	19	Refrig.	3,500	..	..	..	X	..
Progas Ltd.								
Acheson, Alta.	5	Abs.	545	X	X	X	..	..
Big Valley, Alta. (operations suspended in 1956)	3	Abs.	220	X	X	X	..	..
Provo Gas Producers, Provost, Alta.	78	Ads.	1,777	..	..	X	..	..
Royalite Oil Co., Turner Valley, Alta.	85	Abs.	2,000	X	..	X	..	X
Sage Oil Co., Leduc East, Alta.	4	Ads.	65	..	..	..	X	..
Saskatchewan Power Corp., Coleville, Sask.	60	Abs.	2,000	..	..	X	..	..
Shell Oil Co. of Canada, Ltd.								
Jumping Pound, Alta.	90	Refrig.	6,000	..	..	..	X	X
Steelman Gas Co., Ltd., Steelman, Sask.	20	Abs.	6,000	X	X†	X	X	X
Sun Oil Co. Ltd.								
Countess, Alta.	17	Ads.	112	..	..	..	X	..
Enchant, Alta.	5	Ads.	37	..	..	..	X	..
Tennessee Gas Transmission								
Hussar, Alta.	37	Refrig.	460	..	..	..	X	..
Wayne-Rosedale, Alta.	5	Ads.	115	..	..	..	X	..
Texaco Exploration Co.								
Bonnie Glen, Alta.	27	Abs.	4,523	X	X	X	..	..
Gilby, Alta.	17	Ads.	154	..	..	..	X	..
Pembina, Alta.	8	Refrig.	940	X‡	X‡	X	..	..
Texas Gulf, Okotoks, Alta.	12	Amine & Claus	6,215	..	..	..	..	X
Tidal Petroleums & Canadian Chieftain								
Cessford, Alta.	8	Ads.	68	..	..	..	X	..
Western Leaseholds								
Hobbema, Alta.	3	Refrig.	55	..	..	..	X	..

*Sour gas returned to formation. Gas-conservation scheme. †Butanes are fractionated into iso and normal butane. ‡Propane-butane mix product. §Additional products—gasoline-blending stock, naphtha, kerosine, diesel fuel. ¶Processes acid gas from Pacific Petroleums Taylor plant.

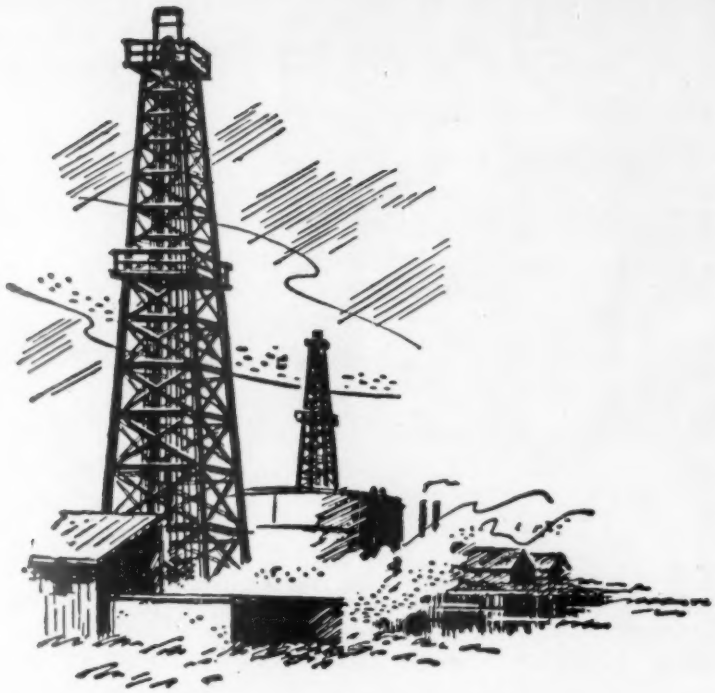


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Table 4—Gas-processing plants approved and proposed since December 1, 1960

Plant operator and location—	Residue gas cap. (M.M.c.f.d.)	Type plant	Compl. date	Investment ($1,000)	Propane	Butanes	Cond.	Sulfur
California Standard Co.								
Gilby (under constr.)	15	Ads.	Dec. '61	199			X	
Canadian Delhi								
Minnehick-Buck Lake (proposed)	40	Ads.	Late '61	1,004		X		
Canadian Montana Gas Co.								
Black Butte (under const.)	10	Abs.	Dec. '61	280		(Negligible)		
Canadian Pacific Oil and Gas								
Wayne-Rosedale (under const.)	10	Ads.	Nov. '61	123			X	
Canadian Superior Oil Co., Ltd.								
Harmatton Elkton (proposed)	100	Comp.-Refrig.	Late '61	3,300			X	
Home Oil Co., Ltd.								
Carstairs*	201	Refrig.	Dec. '61	7,800			X	X
Jefferson Lake Petrochemicals								
Coleman†			Late '61	1,645				X
Mobil Oil Co., Ltd.								
Wimborne (proposed)								
Pan American Pet. Corp.								
Windfall (under const.)	110	Abs.	Late '61	13,303			X	X
Petrogas Processing, Ltd.								
Calgary (under const.)	125	Hot Carb.-Amine	Feb. '62	9,240			X	
Saratoga Processing, Ltd.								
Coleman (under const.)	59	Abs.	Late '61	3,519		(Used as fuel)		
Shell Oil Co., Ltd.								
Harmatton East (proposed)		Comp.	Late '61	551		(Negligible)		
Waterton (under const.)	120	Abs.	Late '61	16,000			X	X
Steelman Gas Co., Ltd.								
Edmonton (proposed)	69	Abs.	Aug. '62	1,600	X	X		
Western Leaseholds								
Wildcat Hills (under const.)	69	Abs.	Late '61	5,224			X	X

*Includes previous 75-M.M.c.f.d. plant. Under construction. †Process acid gas from Saratoga plant. Under construction.

this is in addition to provincial and present export requirements. Also, British Columbia and the Yukon and Northwest Territories are expected to eventually have total gas reserves at least equal to Alberta's.

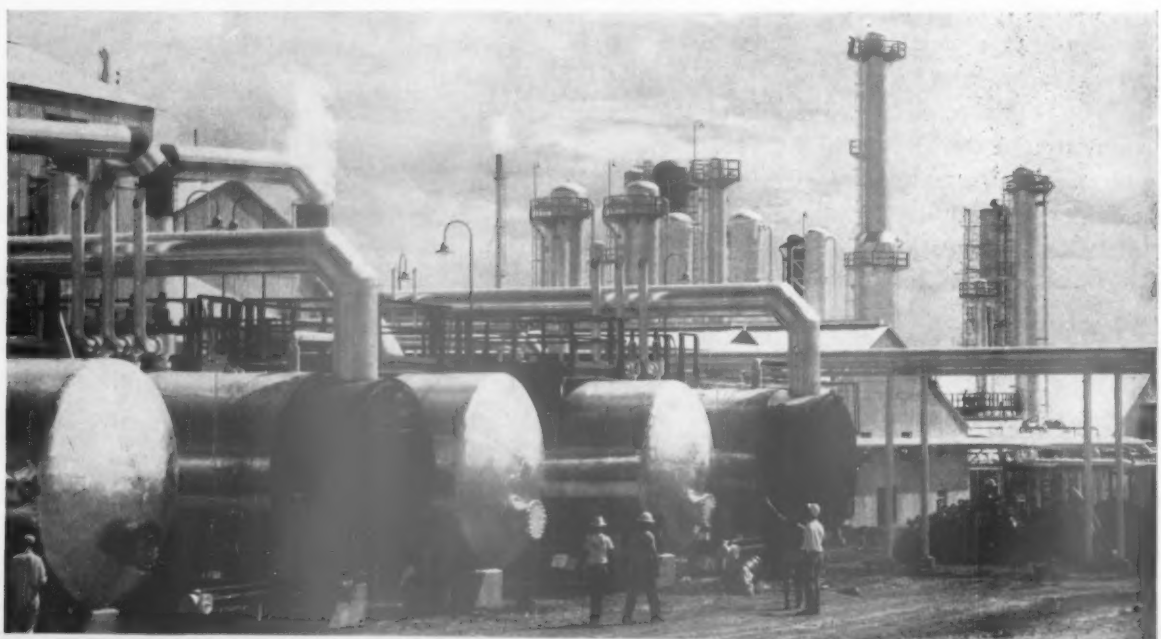
Gas-Processing Facilities

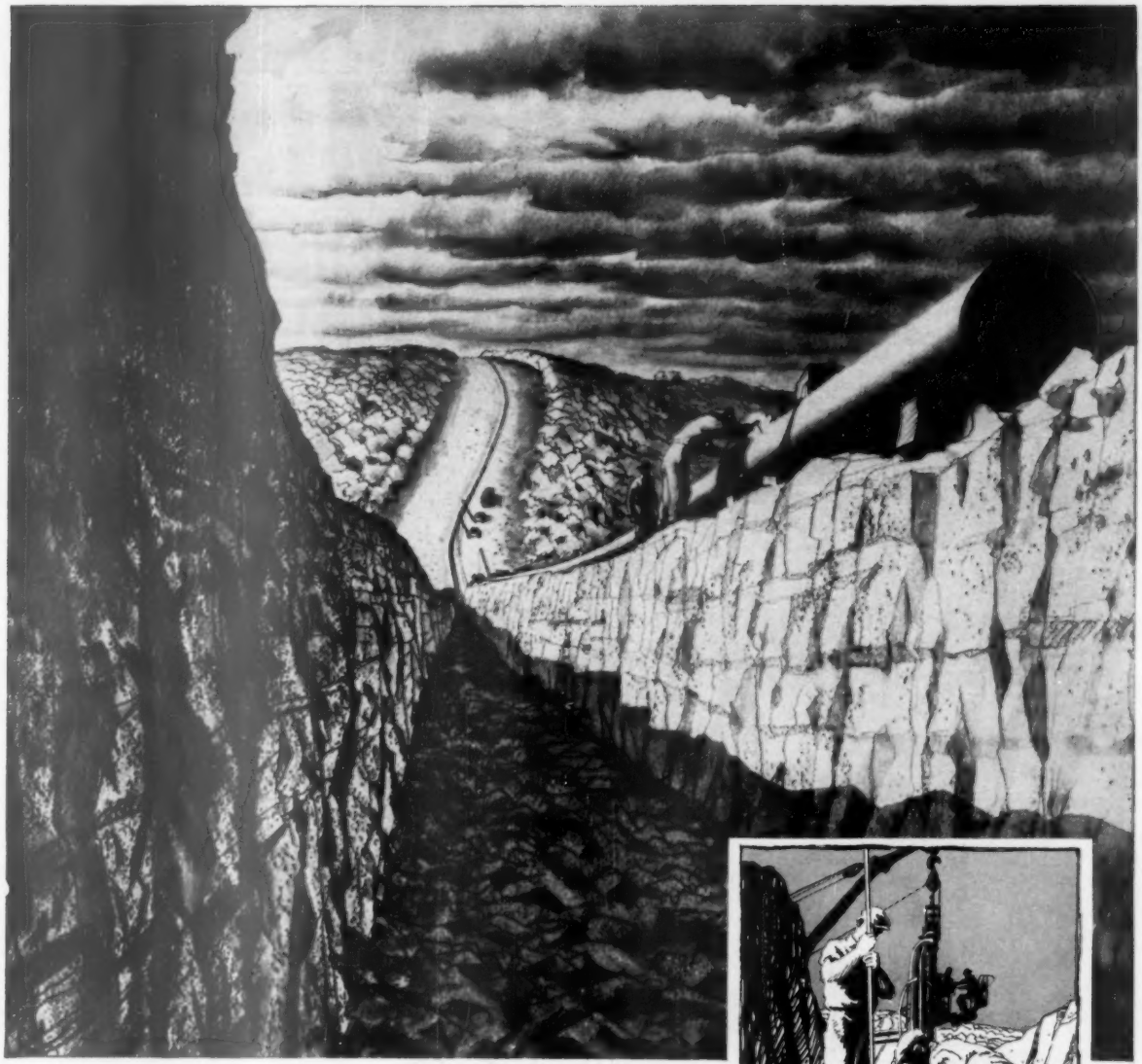
Because of the extreme cold in winter months, Canadian gas-pipeline companies have set very rigid specifications on the quantity of hydrocarbons and water that can remain in natural gas that is to be transported any distance. A hydrocarbon dew point of 150° F. at 800 psi. is the maximum, and water content must be reduced to 3 lb. per million cubic feet or lower. This means that a majority of the gas produced must go through a processing plant prior to entering a transmission line.

Capacity. To be able to handle the large volumes of gas expected to be produced in the near future, plans are under way to increase gas-processing facilities from a capacity at the end of last year of 1,950 M.M.c.f.d. of residue gas to 3,100 M.M.c.f.d. in 1962. And estimates are that total capacity will go to 4,500 M.M.c.f.d. in 1965, and possibly reach 5,600 M.M.c.f.d. by 1970.

Short-cycle units. While most of the above capacity will be repre-

PINCHER CREEK PLANT of British American recovers sulfur, LPG, and condensate.





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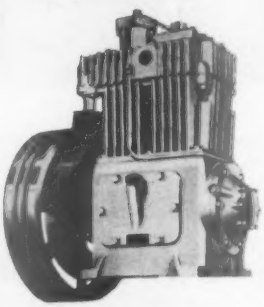

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sented by the standard type of lean-oil absorption plant, there will be many cases where the volume of gas to be processed or the volume of liquids to be removed will not justify an installation such as this. In those instances, the short-cycle, dry-desiccant unit can be used to remove both hydrocarbons and water. At present, 24 of these units are in operation in western Canada ranging in size from 2 to 22 M.M.c.f.d. of residue gas. These plants represent an investment of more than $3 million. Two others now under construction will cost a total of $325,000. The product from a unit of this type is usually stabilized natural gasoline which is quite often blended directly into a nearby crude line.

The short-cycle unit is growing in popularity not only because it can more economically handle small, lean gas, but also because it operates essentially unattended. This means that a full-time operator isn't required; only an occasional check by a field attendant. Some companies have found that a once-a-week check is all that is necessary. This is a real advantage in many parts of western Canada and should result in the installation of many more of these units.

Investment. Gas-processing facilities in place as of the end of 1960 represented a $160-million investment. This will grow to about $245 million by the end of this year and $280 million by the end of 1962 as projects planned or now under construction are completed. Estimates place investment in gas-processing facilities by the end of 1965 at $380 million, and close to $485 million in 1970.

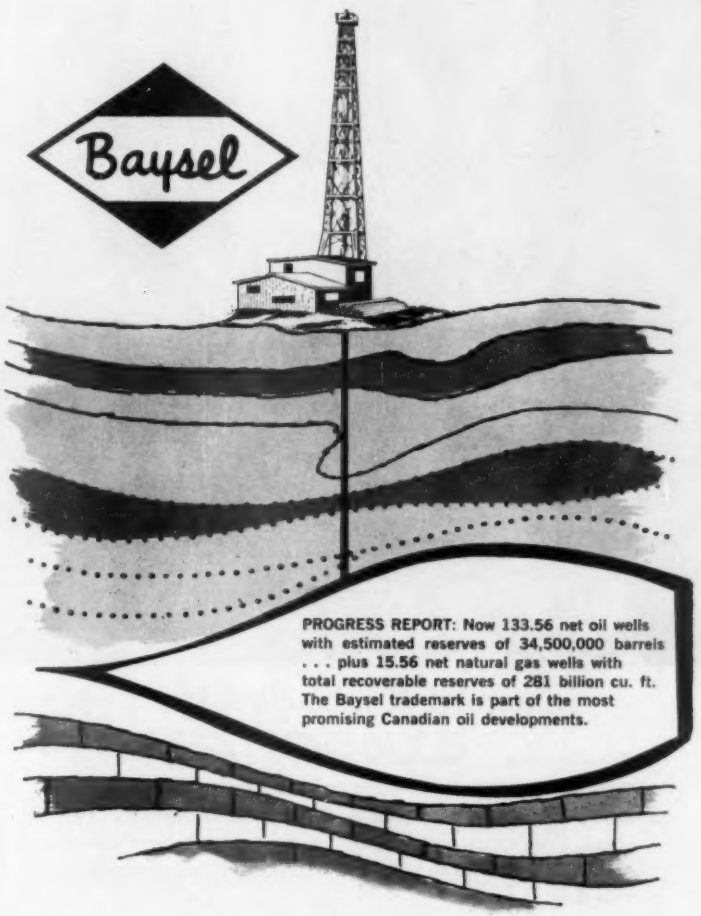
These investment figures are, of course, subject to such factors as discovery rates of new gas reserves and the liquid content of the gas, availability of markets for the plant products, location of markets and type of available transportation, and the willingness of gas purchasers to pay a premium for higher-B.t.u. residue gas.

Liquid production. The rigid pipeline requirements for residue gas require that all the pentanes plus, some of the butanes, and smaller amounts of propane must be extracted from wet natural gas prior to marketing. And since the present market for natural-gas liquids isn't too healthy, processors are in most cases removing only the products necessary to meet these specifications.

Under these conditions, production of the various products during 1961 is estimated to be, in barrels per day: Propane, 7,200; butanes, 6,500; and pentanes plus, 23,900. By 1970, the daily production of propane is estimated at 17,300 bbl., butanes at 15,900 bbl., and pentanes plus at 83,300 bbl. Other estimates are shown in the accompanying graph.

If market conditions improve to the extent that maximum recoveries of products from the gas are economical, daily propane production during 1962 could be an estimated 9,200 bbl.; butanes, 8,800 bbl.; and pentanes plus, 50,600 bbl. By 1970, these production figures could reach 25,900 bbl. of propane, 25,100 bbl. of butanes, and 83,300 bbl. of pentanes plus.

Probably the biggest question mark in Canada's natural-gas industry has been how to dispose of the gas-processing-plant products when gas production hits its stride in 1962. Several extensive studies have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been made along this line. Standard Research Institute made a study for British American Oil Co., Dr. Hu Harries made a study for the Foothills-Westalta group, Purvin & Gertz gathered market data for Canadian Hydrocarbons, Fish Corp. made a study for Provincial Products, and the Alberta Oil and Gas Conservation Board conducted a very extensive study that took into consideration all the other studies.

Close study of these reports plus interviews with many top men in the industry resulted in the following brief summary of the present and future market picture for natural-gas liquids in Canada:

... **Propane.** It seems at present that an ample market exists for propane. Not too much of this product must be extracted from the gas to meet hydrocarbon dew-point requirements, and it is very much in demand during the winter for domestic and commercial heating. Also, there is a fair demand for petrochemical manufacture. Miscible flooding will probably represent a pretty large volume market, but doesn't offer much growth possibilities. Fuel for internal-combustion engines could develop into a good market, but it will take work and time to bring this about.

Even with these big market potentials, there is the possibility that some propane will have to be reinjected into the formations during summer months.

... **Butanes** probably present the biggest problem. A larger portion of this material must be removed from the gas stream to prevent pipeline condensation, and it isn't suitable for heating homes and commercial establishments this far north. However, some small amounts can be used by utility companies for peak-shaving purposes, and for heating by large installations that can justify vaporizing equipment.

The only large outlet for butanes in Canada is refinery use for blending in gasoline and for alkylation units. A small market is projected well into the future for miscible flooding purposes. Also, the manufacture of petrochemicals is expected to require substantial quantities of this product in the future, but this market is very small at present.

For the next few years, at least, it appears that it will be necessary to blend as much butanes as possible into crude lines and put the remainder back into the ground.

... **Pentanes plus.** Essentially all of the pentanes plus must be removed from natural gas before it can be marketed. This results in a tremendous volume of liquid to dispose of. Fortunately, this material can be blended with crude and refined in existing facilities with little or no modifications in equipment required. In fact, it gives a higher gasoline yield than crude, which is preferred under today's marketing conditions. Canadian Oil just recently put on stream, in western Canada, a refinery designed specifically for refining condensates (OGJ, July 3, p. 141). And industry reports say that several more of these will likely be built in the near future.

Since these pentanes plus must be removed from the gas, the official government position at present seems to be that this material should take precedence over crude in refineries when necessary, and be moved to market through existing

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crude-oil pipelines, either blended with the crude or batched.

A recent request for an elaborate pipeline system to transport LPG and pentanes plus from western Canada to the Chicago area was turned down due to reasons set out in a report made by the Alberta Oil and Gas Conservation Board (OGJ, July 3, p. 77).

Sulfur production. Another by-product of gas processing that is giving Canadian producers a headache is sulfur. Some plants are faced with actual mountains of the stuff, and things are likely to get much worse before they improve. Sour gas now being processed ranges in hydrogen sulfide content from 3 to 35% with most supplies in the 6 to 13% range. Plants proposed for the future will be faced with hydrogen sulfide contents between 30 and 35%, and possibly much higher.

From an over-all viewpoint, sulfur production from natural gas is estimated to increase from 1,200 long tons daily last year to 1,500 tons per day this year, and to increase twofold in 1962 to 3,000 tons. By 1965, production will possibly double again to 6,000 tons daily, and even reach 8,900 tons in 1970.

Sales of sulfur are presently running only about half of production. For example, during the first 3 months of this year, Alberta produced 116,000 long tons of sulfur and only sold 57,000 tons. British Columbia's production-to-sales ratio is about the same.

Export markets account for half of present sales, and are located primarily in the U. S. But other markets are being developed in the Pacific area in countries such as Japan, China, Australia, and New Zealand. The best future potential for Canadian sulfur seems to lie in this area. Already one 5,000-ton shipment has been made to Formosa, and several 3,000-ton shipments have gone to Hawaii.

A recent rail-freight reduction on sulfur being shipped to the West Coast for export has improved the future outlook considerably. Also, the picture has been brightened further by a freight reduction on sulfur moving out of western Canada to the Chicago market.

With the firming of sulfur prices and new markets opening up, it seems that for the first time in several years, the general feeling among Canadian sulfur producers is one of cautious optimism.

Effect on Canadian economy. Natural gas will play an increasingly big part in Canada's economy. It has been estimated that gas exports to the U. S. will bring in an average revenue of 100 million U. S. dollars per year over a 25-year period. This will be a big help in improving Canada's trade deficit with the U. S.

Last year's production of 450 billion cubic feet of residue gas, 9 million barrels of natural-gas liquids, and 440,000 tons of sulfur was valued at $60 million. By 1965, the estimated production of 990 billion cubic feet of residue gas, 40 million barrels of natural-gas liquids, and 2.2 million tons of sulfur will be valued at close to $250 million. And during this same period of 1960-65, it will be necessary for the gas industry to spend for gas-gathering lines, transmission lines, processing plants, distribution systems, and development of gas reserves about $1 billion. This is in addition to almost $1.5 billion already invested.

SPIRIT OF INDEPENDENTS

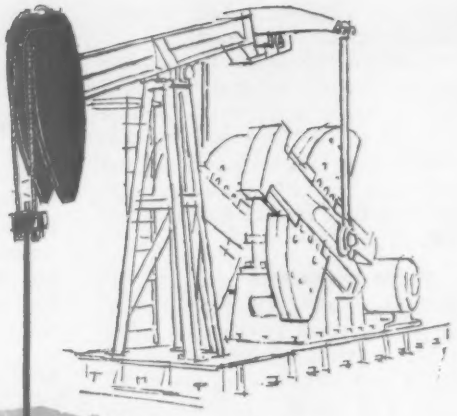
This young fellow will do well if his lemonade is as refreshing as his spirit . . . because the key to winning success against competition is purely and simply product excellence.

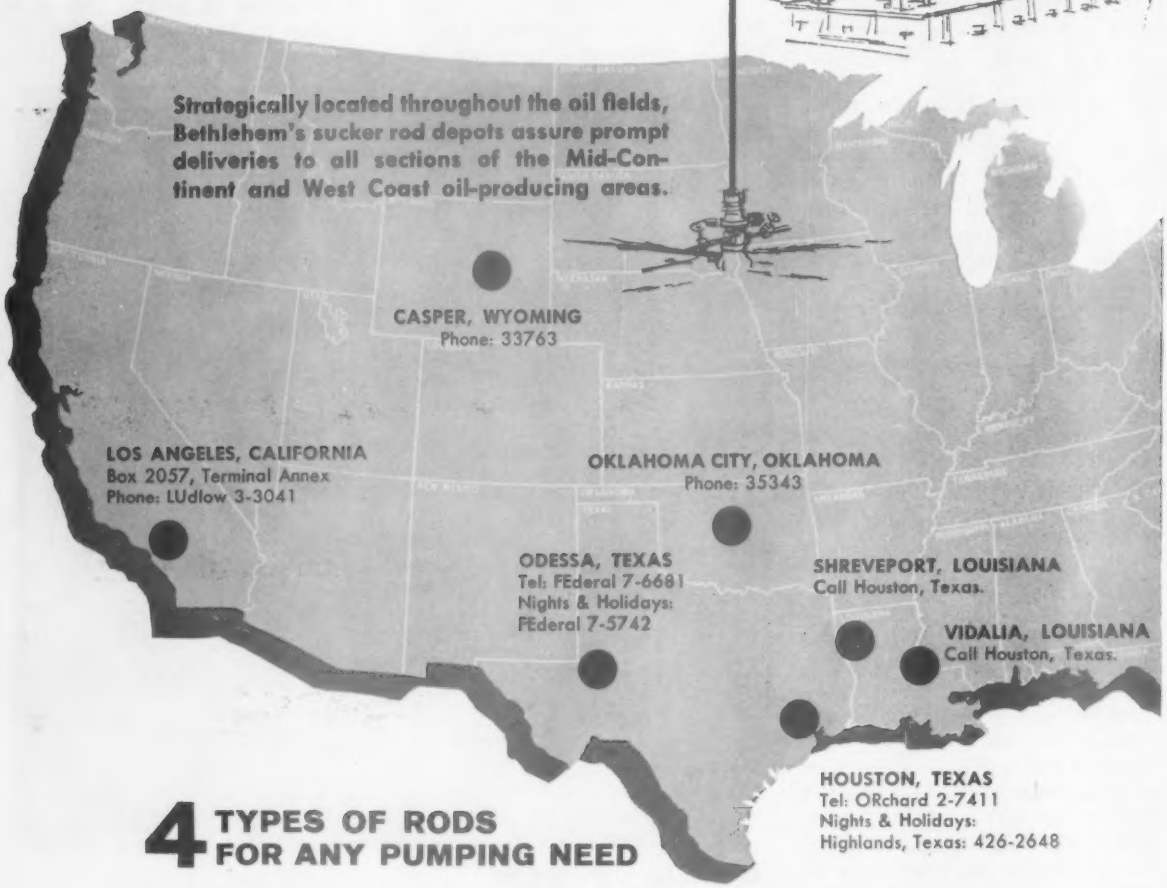
Start with the priceless ingredient of quality — multiply your efforts through good people —*and take good care of your customers.* Canadian consumers admire and encourage this kind of Spirit of Independents.

Canadian **HUSKY** *Oil Ltd.*

GENERAL OFFICES: CALGARY, ALBERTA

Order your sucker rods from these Bethlehem depots





4 TYPES OF RODS FOR ANY PUMPING NEED

46, average tensile strength.....	90,000 psi
X Mayari, average tensile strength..	95,000 psi
X2, average tensile strength.....	100,000 psi
41, average tensile strength.....	130,000 psi

Among these types you will find the best rod to meet the particular requirements of your well.

Steel — *for Strength ... Versatility ... Economy*

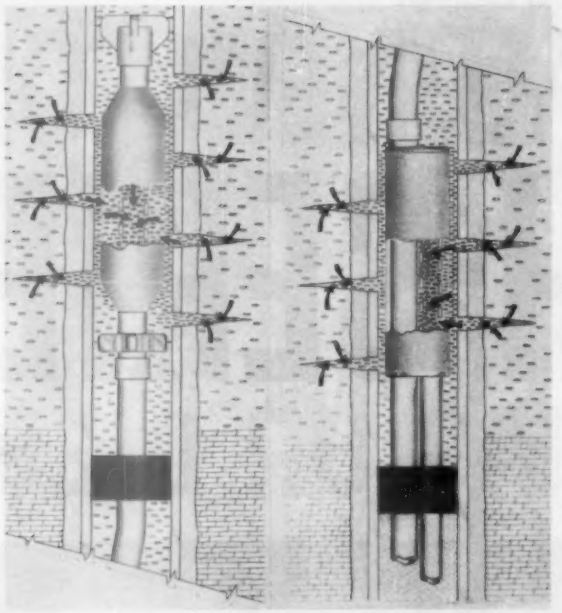
For more information call any of the seven offices shown above, or write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

What's NEW . . . in equipment



Sand screen for dual completions

WHEN sanding problems occur in the upper zones of dually completed wells, a new dual completion screen may give the answer. Effective sand control is based on the running of the maker's regular sand screens opposite the lower zone and the new screen opposite the upper zone. Production from the two zones is kept separate.

Basically, the construction of the regular screen and the new type are identical. An outer layer of consolidated sand is held in place around a mandrel of slotted tubing. One is slotted and receives the production from the upper zone, the other is unslotted and carries fluid from the lower zone.

Two advantages are cited for the sand-control technique. First, the sand screen itself acts as the screening medium—the sand produced from the formation tends to diffuse over the entire surface of the screen, rather than concentrating at restricted points of entry. Second, cost is reduced and less installation time is required than consolidation treatments of the formations demand. Source: **Halliburton Co.,** Duncan, Okla., U.S.A.

Want more facts about equipment or copies of product literature described in this issue?

Send this coupon

to manufacturer at address shown after each item.

Product name, Model no., literature title or number: _____

_____

_____

Described in OIL AND GAS **JOURNAL**-Issue of August 14, 1961

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

Noise suppressed in radios

A MEANS for suppressing ignition-noise interference caused by vehicle electrical systems has been developed for extending the operating range of two-way radio systems in the petroleum industry. The device is said to eliminate the impulse interference generated each time a spark plug fires on a radio-equipped vehicle. These ignition noises are automatically detected in the early stages of the radio receiver. The suppression device, called Extender operation, turns off the mobile receiver for the 2 or 3 microsecond duration of each ignition impulse. It is available as a part of a line of transistorized low-band (25 to 50 mc.) mobile radios. Source: **Motorola Inc.,** 4501 W. Augusta Blvd., Chicago 51, Ill., U.S.A.

•

Chemical pump of titanium

The outstanding corrosion resistance of titanium has recently been put to use in the construction of a line of chemical pumps. The titanium pump is expected to give longer life and require less maintenance than one using stainless steel.

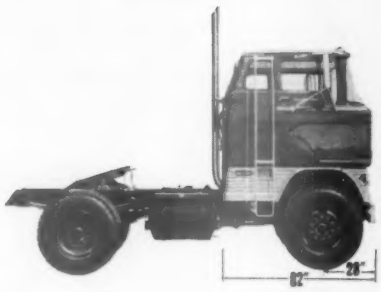
The horizontal pumps in the Gush series are available for heads

THE NEWEST REASON TO MAKE YOUR NEXT TRACTOR A FORD:

ALL-NEW FORD H-SERIES GAS OR DIESEL

FORD DIVISION, *Ford Motor Company*

Ford H-Series tractors offer a choice of five Super Duty V-8's or four proven Cummins Diesels for maximum performance, economy and durability! Over 500 engine-transmission-axle combinations provide "job-fitting" economy on any run.



New Ford H-Series tractors have a short 28-in. BA for hauling maximum legal loads in most "bridge formula" states. And their compact 82-in. BBC dimension accommodates longer high-cube trailers. For greater payloads within their 76,800-lb. maximum GCW range, strong lightweight components are used wherever consistent with maximum durability. Extra-hi-tensile steel frames, fiberglass cab skirts, aluminum steering gear housing, and optional aluminum disc wheels, transmission cases and fuel tanks are typical examples of Ford's weight-saving design.

Ford H-Series models are quality-built to the most exacting standards in the industry. They're the only tractors with gas engines so dependable they're dealer-warranted for 100,000 miles. And maintenance-engineered design means fewer downtime delays . . . lower maintenance costs.

SEVEN MORE REASONS

WHY IT'S GOOD BUSINESS TO DO BUSINESS WITH FORD!

You save from the start with Ford's traditionally low prices, and your savings continue with low operating and maintenance costs. These facts are documented by certified test reports from America's foremost independent automotive research firm. Ask to see these reports. They're on file at your Ford Dealer's.

In addition to these dollar-and-cents savings, the following bonus benefits are yours with Ford Trucks:

1. **Rigid quality controls** give you the strongest safeguard of truck reliability ever. Modern, *exclusive-truck* manufacturing facilities, with emphasis on quality every step of the way, are designed to give you a Ford Truck that is as free from defects as a truck can be. Tangible results of these high standards are Ford's new warranties.

2. **Exclusive 100,000-mile warranty** (or 24 months) on 401-, 477- and 534-cu. in. Super Duty V-8's is the most liberal in the industry. Each major engine part (including block, heads, crankshaft, valves, pistons, rings), when engine is used in normal service, is warranted by your dealer against defects in material or workmanship for 100,000 miles or 24 months, whichever comes first. The warranty covers full cost of replacement parts . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.

3. **12,000-mile warranty** (or 12 months) on all 1961 Ford Trucks of every size is further evidence of the confidence Ford has in its quality controls. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

4. **Special fleet financing** can be arranged by your Ford Dealer. It's available for owners of two or more trucks, and provides the opportunity to precisely tailor payments to your income patterns or depreciation schedules. This fleet-fitted financing offers substantial savings and frees your working capital.

5. **Sales engineers and service specialists** in 36 district offices are on call to solve special truck problems. Working with both dealers and customers, these experienced truck men represent another extra step Ford takes to provide your continued satisfaction.

6. **Replacement parts depots** at 26 strategic locations across the country quickly supply needed parts from ample stocks. Ford's entire supply system is geared to give you faster service and reduce costly downtime . . . *wherever* you are.

7. **6,800 Ford Dealers,** including 280 specialized Heavy Duty truck dealers, can keep your trucks ready to go wherever they go. From coast to coast, fast Ford service—gas *and* Diesel—is always close at hand.

From Super Economy pickups to Diesel-powered tractors, you can now fill every truck need up to 76,800 pounds GCW with a modern, money-saving Ford Truck.

QUALITY-BUILT...MAINTENANCE-ENGINEERED

FORD TRUCKS COST LESS

from 10 to 150 ft. and with capacities from 2 to 1,000 g.p.m. All wetted parts are made of solid titanium. The pumps may have either packed gland or mechanical seals. Source: **Appleton & Howard Ltd.**, St. Helen's, Lancashire, England.

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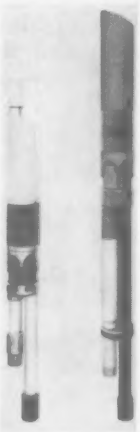
New packer design for duals



In two-packer, parallel-string installations, this new dual-completion packer design is available to serve as the retrievable upper packer. Both long and short-string set models and a long-string set double J-latch model are available in sizes to fit 5½ and 7-in. casing.

All packers are designed to be set and released as many times as necessary and to be set by tubing weight only. Two of the design principles included in the short-string set duals of interest are (1) collet type of seal units that require no rotation for release and will not sand lock, and (2) a one-piece mandrel intended to permit rotation of the tubing before or after setting. Source: **Otis Engineering Corp.**, Box 35206, Dallas, Tex., U.S.A.

•

Ear protectors to guard hearing in noisy plants

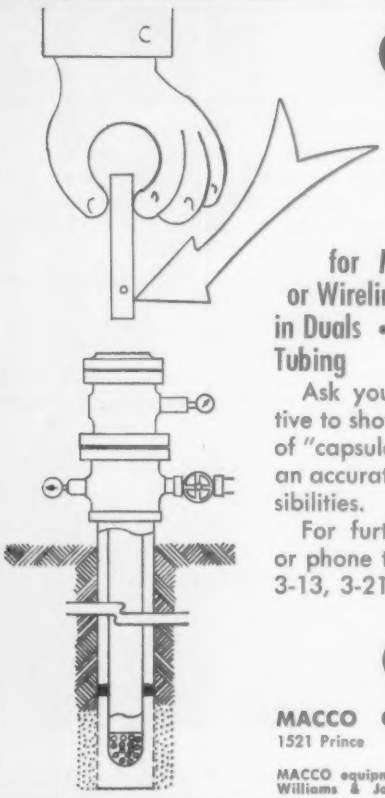
When workers are exposed to extreme noise levels in plants, a new ear protector for use with safety caps is available that offers protection to hearing. The Model 372-26K ear protectors can be integrated quickly and easily into most safety caps. The kit, of which they are a part, includes the necessary fittings to attach the domes to the cap. Source: **David Clark Co., Inc.**, 360 Park Ave., Worcester, Mass., U.S.A.

•

Tubing for deep wells

An Acme-thread tubing with a nonupset, high-strength joint has been disclosed for deep wells and multiple completions. The new joint design is claimed to give maximum clearance with joint strengths considerably above the yield strength of the tubing body.

The dimensions have been re-



GAS LIFT
IN A
"CAPSULE"

USE MACCO CAPSULES
for Macaroni or Parallel Strings
or Wireline Retrievable Packoff Anchors
in Duals • Slim Holes • Inside Regular Tubing

Ask your nearest Macco representative to show you where to install a string of "capsule" gas lift valves and give you an accurate estimate of oil recovery possibilities.

For further information, write, wire, or phone today for Brochure Nos. 3-12, 3-13, 3-21, 3-31, and 6-12.

MACCO

MACCO OIL TOOL COMPANY, INC.
1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253
MACCO equipment is also available in sterling areas from Williams & James (Oil Tools) Ltd., Gloucester, England.

STANDS ALONE

IN QUALITY, PERFORMANCE, REPUTATION

TXT RIG HEATER

PROVED SAFE, DEPENDABLE IN EVERY INSTALLATION

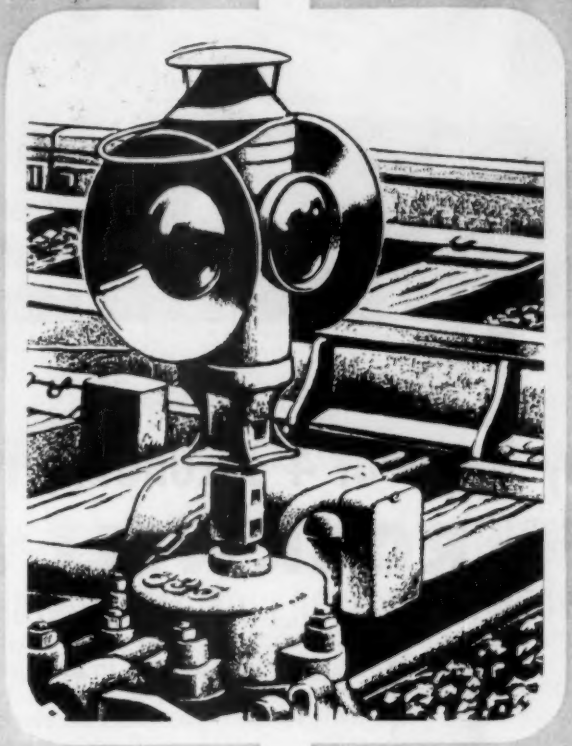
TXT Rig Heaters, in either of two sizes, meet with ease all the requirements of a power rig for a dependable source of heat in cold weather operations. They have proved, time and again, completely safe, simple to operate, automatically and precisely controlled. TXT Rig Heaters offer those "extra" qualities, too, needed for rugged performance in the field. Available in the 25MS (65 hp) model, generating 2,176,000 BTU output; and the 10MS (35 hp) model, 1,000,000 BTU output.

***Write for Catalog RH-1**

TXT TEXSTEAM
A SUBSIDIARY OF VAPOR HEATING CORPORATION
Corporation

328 HUGHES ST. • P. O. BOX 9127
HOUSTON 11, TEXAS • PHONE WA 8-0853

Why switch?

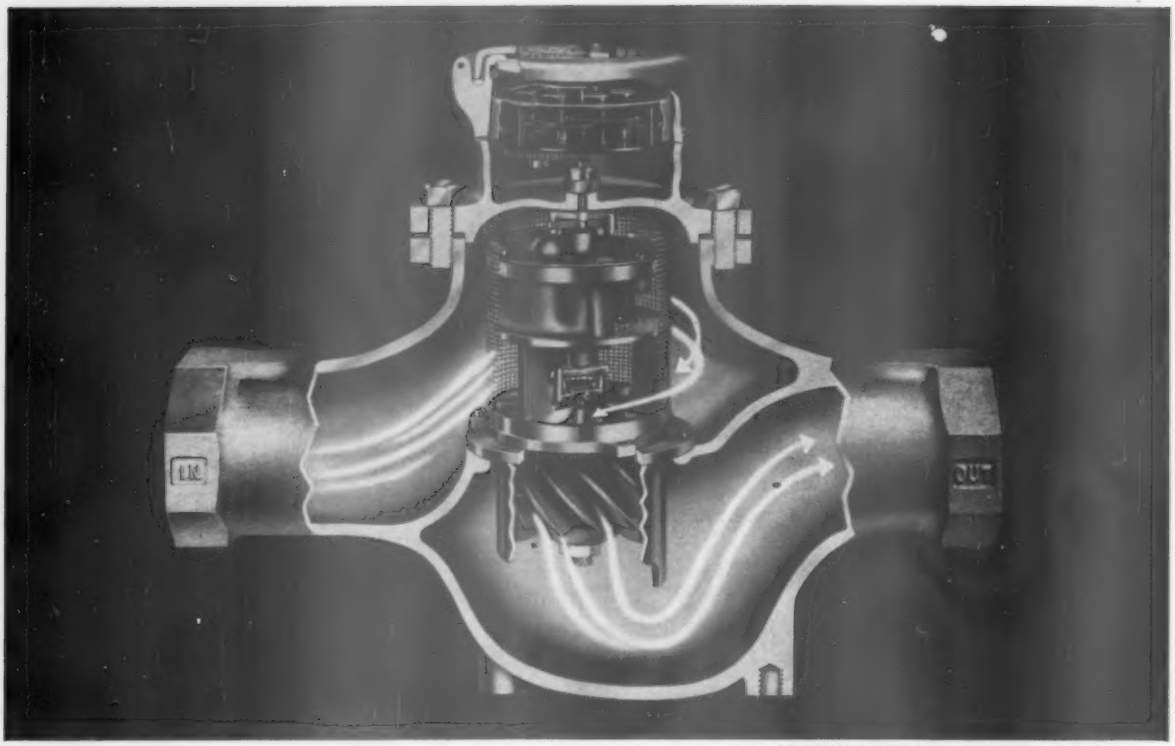


Key chemical transportation for caustic soda

Once by rail, always by rail? Not necessarily. Changes in tonnage, freight rates, or facilities for storage may make a switch to barge shipment of liquid caustic a wise move. This is something we check carefully—and often—for our customers. With our Wyandotte plant at the hub of the Great Lakes, and our Geismar plant near the mouth of the Mississippi—we are ideally situated to ship by barge, rail, or truck. Call us.

WYANDOTTE CHEMICALS

MICHIGAN ALKALI DIVISION, WYANDOTTE, MICHIGAN



PROPELLER TYPE for measuring the entire input to a field. Made with bronze, iron or steel cases for up to 2500 psi working pressure in sizes 2" to 6".

Why 3 out of 4 secondary recovery systems use ROCKWELL METERS

DISC TYPE for measuring and balancing water input to individual wells. Sturdy bronze case is designed for 2000 psi working pressure. Optional coupling sizes of ½", ¾" or 1" simplify installation.

Over twenty years ago we developed the first successful meter to measure water forced into the ground at spaced flooding points. Now about 75% of all secondary recovery systems use Rockwell meters.

Successive improvements, plus optional materials make today's meters an even better buy. For instance interior parts of either bronze or nickel alloy are optional depending on an analysis of the water.

In both the propeller and disc types, the meter register has a sweep hand with a dial reading to 1/10th barrel per revolution. This permits you to time input rates quickly and accurately.

You can buy Rockwell meters right off the shelf at leading supply stores. Ask for them by name.

Write for free wallet size "Reddi-Rate" setting table to simplify your calculations. Rockwell Manufacturing Company, Dept. 132H Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

Buy at Your Supply Store

WATER FLOODING METERS
another fine product by
ROCKWELL

duced from the standard Acme thread in a 4-to-3 ratio. The threads have been run out completely, extending them on a constant taper to the outside-diameter surface of the tubing.

The number of threads has been increased to give greater strength and leak resistance. The full thread run-out of the new Acme thread has an 8-pitch thread, 0.045 in. deep, that provides 17½ perfect and 11½ imperfect threads. An 8½-in. coupling is available with beveled ends for use on multiple-completion wells. Source: **Pittsburgh Steel Co.**, P. O. Box 118, Pittsburgh 30, Pa., U.S.A.

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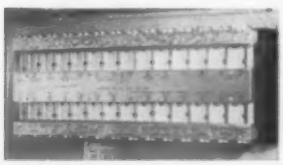

Ball in tube indicates flow rate

When flow increases through this direct-flow indicator, a ball in a transparent tube with a tapered bore rises in the tube and indicates the flow rate. The indicator, compact and easy to read, comes in three types: (1) a single indicator suitable for use in any oil line, (2) a replacement indicator that can be substituted directly for other types of sight glasses, and (3) a multipoint panel, compact arrangement for use where a large number of indicators is needed, with all units grouped together so several flows can be checked at once. Operating pressures may be up to 1,000 psi. Source: **Alan Muntz & Co., Ltd.**, Browells Lane, Feltham, Middlesex, England.

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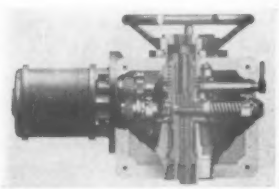
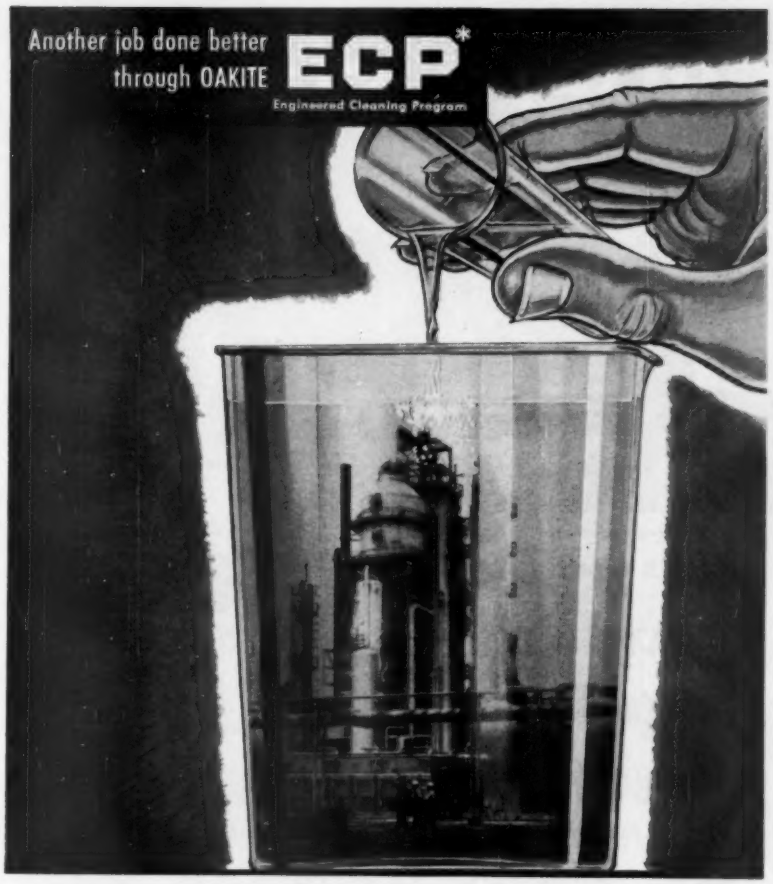


Automatic control for any valve

Power operation for any valve is offered by this LimiTorque actuator. It can be fitted to any type or size of valve, and it can be readily



New Oakite Acalaid® "supercharges" solutions for toughest soil removal

Newest industrial cleaning developments from the most modern research laboratory become part of an Oakite Engineered Cleaning Program wherever they can improve results.

Such a material is Oakite Acalaid. A liquid additive, it steps up cleaning efficiency of acidic or alkaline solutions against problem soils. It adds solvent action to their detergency. It has a super-penetrating effect for extra power to pry loose those tenacious carbons and scale found in heat exchangers and processing columns.

At one refinery, the tower that was traditionally toughest of all to clean was pronounced "slick as a hound's tooth" after a turnaround. An ECP that combined Oakite 85 and Oakite Acalaid made the difference.

This proves the point that with Oakite ECP you profit from properly engineered *materials* and *methods*.

*Oakite ECP is a comprehensive cleaning program engineered to fit your particular operation under the experienced supervision of a local Oakite man. ECP covers every cleaning need. For details, write Oakite Products, Inc., 44C Rector St. New York 6, N. Y.

OAKITE
over 50 years' leadership in industrial cleaning
Est. 1909
SCIENCE

OAKITE ECP benefits you from the ground up . . .

at drilling site it speeds such salvage operations as paint stripping, rust removal, degreasing

it restores pipeline efficiency through chemical cleaning.. it simplifies pump station housekeeping

ROPER PUMPS

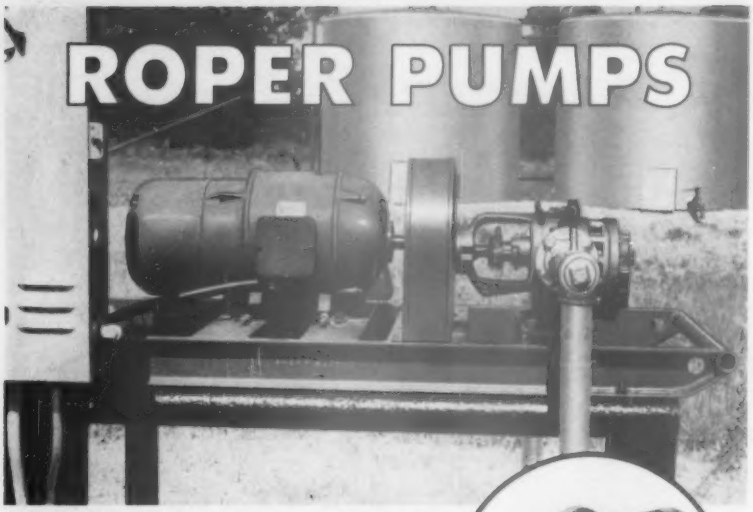
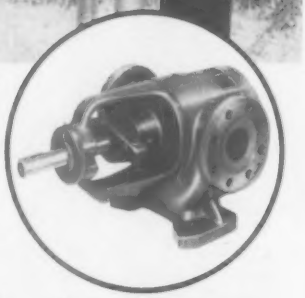


Photo courtesy Harley Sales Co., Tulsa, Wichita, Houston



SERIES H MODEL H-20 SPEC. 5

low cost units designed to meet changing requirements of producers

• **OUTPUT CAPACITIES: 5-75 gpm** • **OPERATING AT PRESSURES TO 1000 PSI**

This Oklahoma oil field unit is packed box Model H-20, mounted on stilts as protection against the lowland area's frequent floods. Normal production of 18 barrels per hour is maintained at 400 psi discharge pressure. Pump is short-belted to 5 hp electric motor and both units are mounted on structural steel skid for easy installation or removal for use elsewhere.

Low initial price and its flexibility to meet changing oil field requirements are two features which make the Series H a popular unit with oil producers. Designed to operate at direct motor speeds, its dependable output at high pressures makes it ideal as pipeline gathering unit or as carrier of crude oil from lease to pipeline system. Replaceable wearplates and reversible center case make the Series H economical to operate, easy to maintain.

Engineered Protection Against Wear

• **THRUST LOADS** are absorbed by drive shaft, separate from drive gear.

• **FRICTION** is reduced, especially in heavy loads, by roller bearings and bronze wearplates, two on each side. Journal and bearings are lubricated and protected against overheating by hydraulic action.

• **PERFECTLY BALANCED** construction and precision manufactured hardened and ground gears maintain high volumetric efficiency of Series H at great pressures.

For information about your specific pump needs contact your nearest Roper dealer

Send for "How to Solve Pumping Problems" booklet

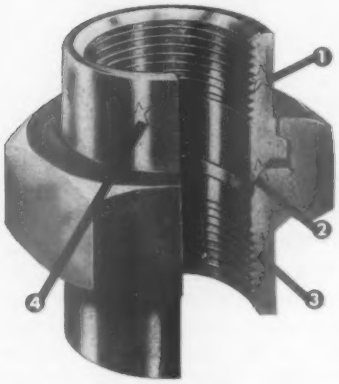
ROPER HYDRAULICS, INC.

Dependable pumps since 1857

COMMERCE, GEORGIA

only CATAWISSA

gives you all these features for your forged steel pipe union requirements



1. **Uniform walls** for even expansion and contraction under temperature changes. They follow the pipe!

2. **Catawissa Ball-to-Angle Seats** give you a "Perfect Seal" regardless of pipe alignment!

3. **More than adequate** wall thicknesses give you Catawissa's 3-to-1 Safety Factor (3000-lb. service, 9000-lb. test; 6000-lb. service, 18000-lb. test)!

4. **Round, straight barrels** for fast wrenching. No uneven or tapered surfaces to cause wrench slips or wrench locking!

Catawissa Perfect Seal Pipe Unions are made by Union Specialists from 80,000 lb. tensile strength steel (ASTM Spec. A-105-55T, Grade II). Steel forgings from our own forging mill are closely checked for imperfections . . . and finishing on modern, automatic machines with close inspection during and after production give you pipe unions second to none!

Write for Catalog 60 showing the complete Catawissa line of Perfect Seal Products.

for complete, guaranteed satisfaction

. . . always specify **CATAWISSA**

CATAWISSA VALVE & FITTINGS CO.

CATAWISSA • PENNSYLVANIA

adapted for motorization of manually operated valves now in service.

The actuator is available in designs suitable for operation of valves by electricity, air or natural gas pressure, or hydraulic pressure. Design features include torque and position-limit switches, a hammer blow for unseating stuck valves, a handwheel for emergency operation, and interchangeable helical primary gears that can be changed quickly in the field to change the operating speed. Source: **Limi-Torque Valve Controls Ltd.,** Newbury, Berkshire, England.

●

Diesel-electric mobile crane

At an 8-ft. 2-in. radius, a mobile diesel-electric mobile crane now on the market has a hoisting capacity of 13,200 lb. At a 40-ft. radius, its capacity is 1,850 lb.

Several engines are optional. The generator is coupled elastically to the engine and is rated at 23 kw., 220 volts, at 1,500 r.p.m. Total working weight of the Type L 6 crane is 32,500 lb. It measures 7 ft. 10 in. wide and 10 ft. 10 in. high when in transport position. Source: **De Nederlandsche Staalindustrie N.V.,** P. O. Box 6009, Rotterdam 7, Holland.

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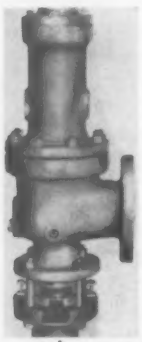
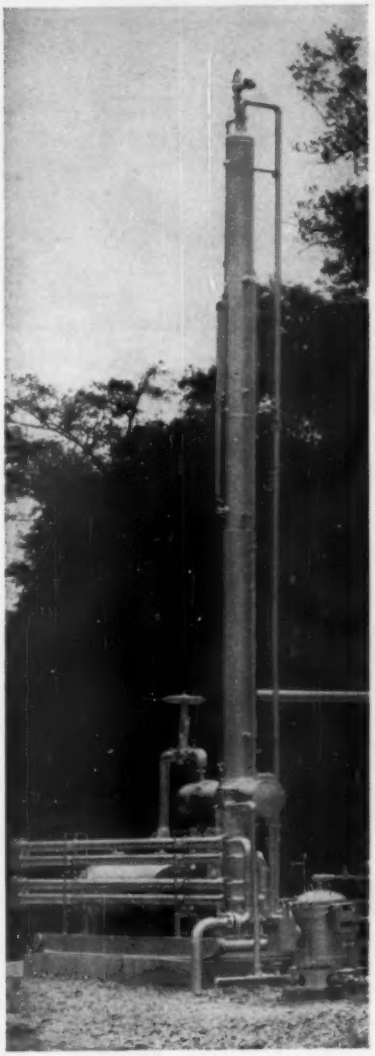
Safety head prevents vapor loss

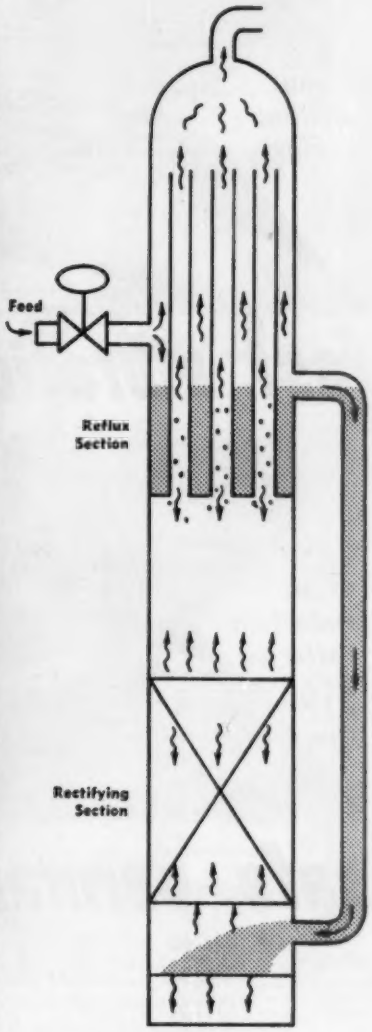


A new safety device has been developed, called a Quik-Sert, that can be installed underneath a safety or relief valve to give an absolute seal and so prevent the loss of vapor through the relief valve. The device nests inside the studs of ASA flanges and contains a rupture disk to protect a vessel or system from overpressure.

One of the noteworthy features of the safety device is that it can be pre-assembled away from location. Another is that it isolates the valve from the process, offering a way to minimize valve maintenance. Source: **Black, Sivalls & Bryson, Inc.,** 7500 E. 12th, Kansas City 26, Mo., U.S.A.

Maloney-Crawford's New Auto Reflux Stabilizer Can Increase Condensate Income Up To 25%



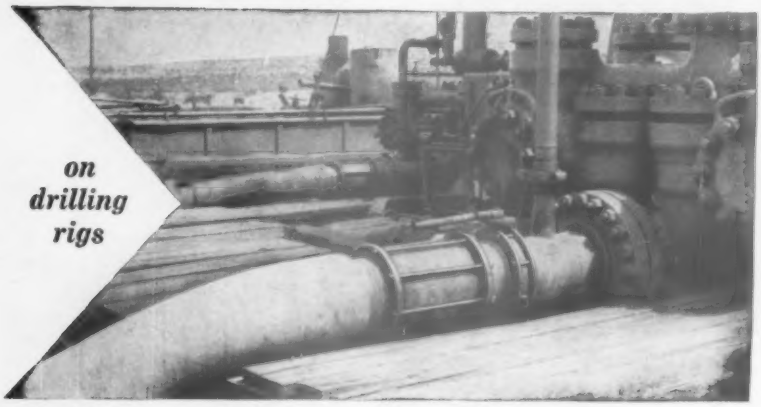


The Maloney-Crawford Auto-Reflux stabilizer has been field-proven to increase condensate sales up to 25 per cent even with lower operating pressures and inlet feeds as high as 85 F. M-C has broken the inlet temperature barrier with a patented feed exchange system built into the top of the column, as shown in the simplified drawing above. This unique system utilizes the throttling cooling of the feed to provide a rectification section and to reflux the column. It is especially well suited for use downstream from hydrocarbon recovery units and gas plants. Write for full details!

Maloney-Crawford

Box 659 **Tulsa**

Dresser® Couplings—



fast, vibration proof...

safe, permanent joints!

Dresser Couplings are easily installed . . . only two man-minutes per bolt with a simple hand wrench. The specially compounded Dresser Gasket provides the essential "give and take" to absorb vibration, settlement, and other stresses that might cause damage. It also allows up to 4° pipe deflection at every joint and still maintains a permanent, bottle-tight seal. Eases of take-down and re-usability of Dresser Couplings are a tremendous asset where you may need to add new pumps, valves or lines. Send for Dresser Catalog No. 531. It contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford
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S. San Francisco
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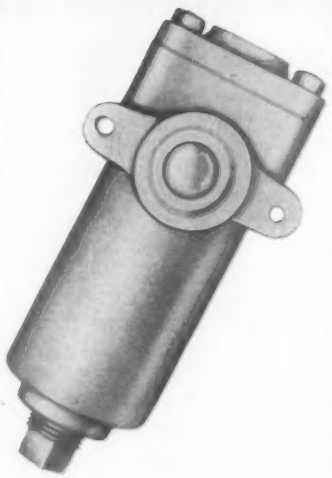
DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

Save time, trouble!
Determine cause of engine shut-down
with
Amot
Model 2400
Indicating Relay



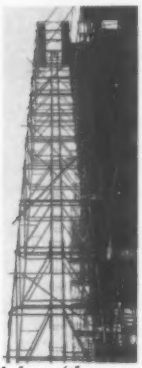
Amot Model 2400 Indicating Relay tells which engine hazard caused shut-down, (whether low oil pressure, high water temperature or what).
Uses air or gas pressure to function. One Relay used for each safety component in system.

If condition is dangerous, Relay will act to vent Safety Control and shut down engine. Quick check of indicator shows cause of shut-down. Each Relay automatically resets itself when engine is again started. Can be easily installed on existing engines. For information on components, controls or systems, ask for Bulletin Q-5.3.

Amot controls
CORPORATION
THERMOSTATS
CONTROLS
SWITCHES VALVES
SAFETY CONTROLS

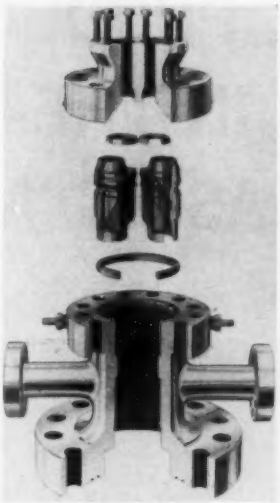
415A FIRST ST. • RICHMOND, CAL., U.S.A.

Hoist tower is easy to construct



By means of a welded frame structure and the use of a triangular crossbrace to connect the frames, a developer has come up with a fabricated hoist tower that is quite simple to construct and easily and quickly handled. About 50 ft. of tower has been erected by unskilled labor (three men) in only 2 hours.

Designed to eliminate loose fittings, the hoist tower consists of only three parts: frame, crossbracing, and spacer tube. The spacer tube reinforces the access openings. The frame measures 6 ft. wide by 6 ft. 5 in. high and is connected by crossbraces which come in three size: 5 ft. 6 in., 7 ft., and 8 ft. 10 in. This size range should contain any center-slung or cantilever materials hoist and most conventional passenger hoists. Source: **Sterling-Safway, Ltd.,** Iddlesleigh House, Caxton Street, London S.W. 1, England.



Tubing head for multiple strings

Full passage of packers and other tools to the oil string is provided by a new multistring tubing head which has been brought out. Fixed lugs within the head automatically align

MIDGET WEIGHT INDICATORS

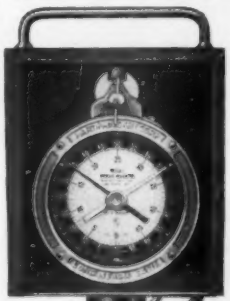
A New Concept In Weight Indication for the Well Servicing Unit

Where no deadline anchor is required, the MIDGET anchors the line with a heavy-duty, extremely rugged hydraulic cylinder and piston. The signal developed is transmitted to the gauge maintained near the hoist operator.

The gauge is a 6" fluid filled instrument of the highest quality with a damper for adjusting the pointer movement to the proper sensitivity. The fluid filled case also reduces severe pointer movement and lubricates and protects the working parts.

Two pointers are provided, one reads the total hook load in pounds for two or four lines strung, and the other is a target pointer.

A quick coupling located in the rear of the instrument box permits the cylinder and hose assembly units to be quickly separated without loss of fluid or altering the calibration.



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WRITE FOR DESCRIPTIVE LITERATURE
MARTIN-DECKER CORPORATION, DEPT: P-98
3431 CHERRY AVENUE, LONG BEACH 7, CALIF

World's principal manufacturer of Oil Well Drilling Instrumentation

45 HANDY HYDRAULIC HELPMATES for OIL FIELD MAINTENANCE

BOTH HAVE THE FAMOUS "SIMPLEX" CENTER-HOLE FEATURE

Pull or push is right through the hole in the center of the ram which provides its own back-up . . . Simplifies rigging, eliminates torque, makes jobs 6 times faster and easier.

SIMPLEX "RE-MO-TROL" HYDRAULIC JACKS and PULLERS

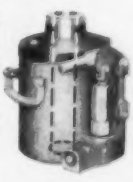
For heavy-duty gear, sleeve and cylinder liner pulling; slush pump repair; pipe and culvert pushing; heavy rigging; leveling and lifting jobs of all kinds.

39 models, 10 to 300 ton capacities, remote controlled hand or powered pumps.

SIMPLEX "JENNY" HYDRAULIC PULLERS (Self-Contained)

Remove and install bearings, sleeves, bushings, liners, gears, pulleys, pinions, pins, on all kinds of machinery and equipment.

6 models, 30 to 100 ton capacities, single and double pump types.



FOR FULL DETAILS Write for Hydraulic Catalog

SIMPLEX RE-MO-TROL UTIL-A-TOOL JACKS JENNY ROL-TOG

TEMPLETON, KENLY & CO.
2539 Gardner Road
BROADVIEW, ILLINOIS

A. C. Templeton, 5627 Del Roy Drive, Dallas, Texas

PRODUCING STEEL THAT CUTS IN-THE-HOLE COST OF CASING AND TUBING

Republic leads in the electronic investigation of steelmaking processes

To make better steel, to bring you greater value, Republic is probing deeper into the processes that make steel, shape it, pierce or form and weld it into casing and tubing.

"Details" that can improve the quality of pipe are being investigated by using the most modern techniques. Through data logging, for example, dozens of process variables are measured at one time, recorded at given intervals, played back again and again in the research laboratory.

It is on the broad technological front that the invaluable customer services are performed. Republic pioneered electric resistance weld casing and tubing . . . was first to data log the electric arc furnace . . . was first to data log the open hearth furnace . . . has contributed over 75% of the steel industry developments in electronic, nondestructive testing . . . is ahead in the application of nucleonics to steel research and production.

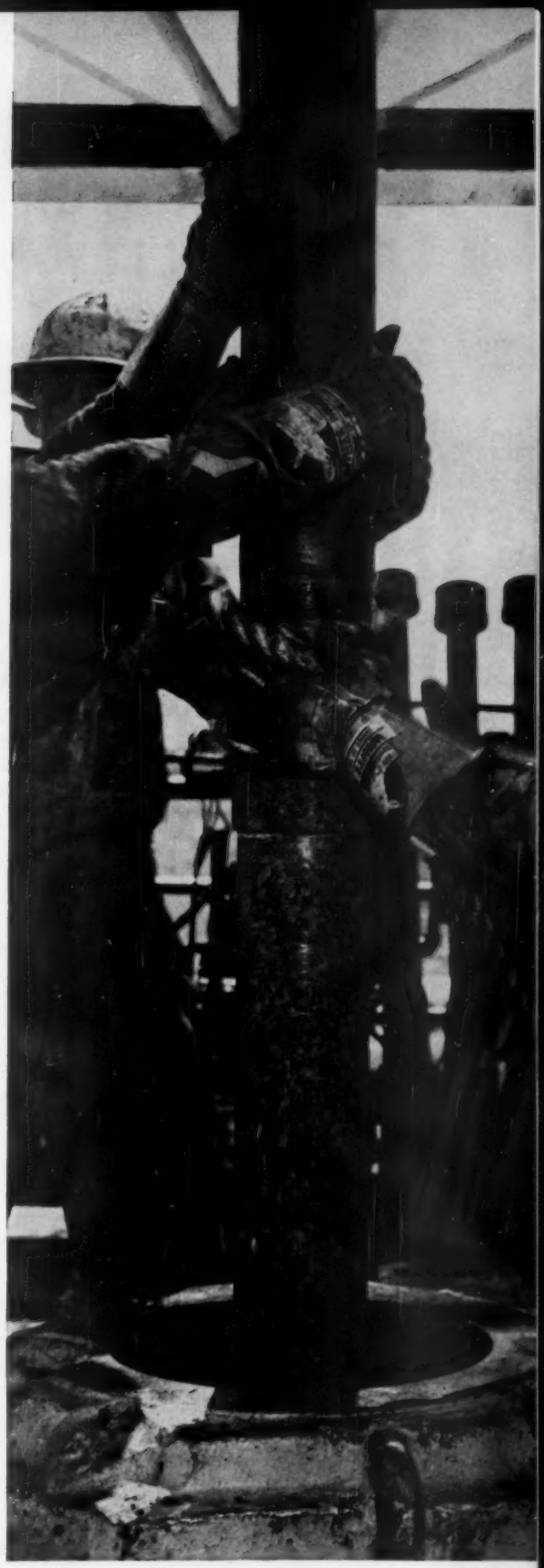
REPUBLIC STEEL

Cleveland 1, Ohio

REPUBLIC HAS THE FEEL FOR MODERN STEEL

ELECTRIC WELD AND SEAMLESS TUBING: 2⅜", 2⅞", and 3½" O.D. in H-40, J-55, or N-80. ELECTRIC WELD OR SEAMLESS CASING: 4½", 5½", 6⅝", 7", 7⅝", 8⅝", 9⅝", 10¾", and 13⅜" O.D. in H-40, J-55, N-80, or P-110. Buttress Threads available in 5½", 7", 7⅝", and 9⅝" O.D. Contact your Republic representative or mail the coupon on the following page.

Strong, Modern, Dependable



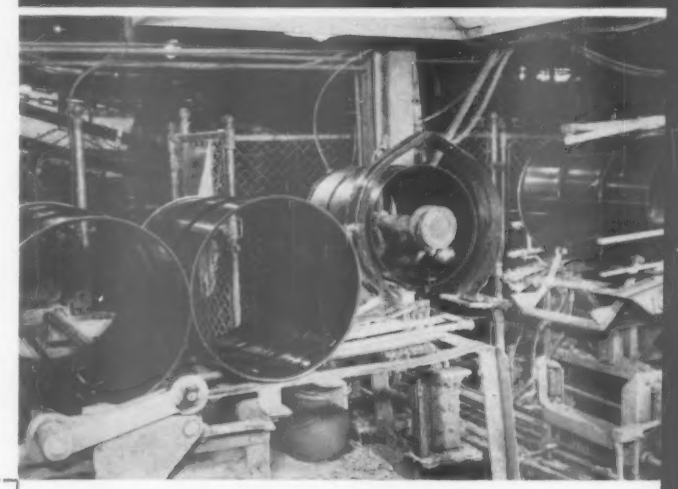
FOR GREATER RELIABILITY...

THE STRENGTH OF STEEL

Republic Light Wall Line Pipe has the strength needed to withstand dents, slashes, and ruptures in temporary field installations and Victaulic Couplings speed joining and disassembly. Republic Light Wall Line Pipe is produced from highest quality carbon steel, grooved at the mill, carefully inspected and controlled through every step of manufacture. Send for information.

HARD, WEAR-RESISTANT SURFACES

Republic Alloy Steels offer outstanding strength-to-weight ratios with the highest strength values. Uniform response to heat treatment assures complete deep-hardening penetration, wear-resistant surfaces. The nation's largest producer of alloy steels, Republic offers 3-DIMENSIONAL metallurgical service that helps you select, apply, and process the alloy steel best suited to requirements. Return coupon for information.



ELECTROSTATIC LACQUERING

Republic's ELECTRO-LAC drum lacquering process assures better protection for your product. A fine lacquer mist is dispersed from a high speed distribution head. This mist is uniformly attracted (as a result of an electrostatic field produced in the drum) over the entire interior. Thin spots in the coating are eliminated. Ask your Republic Container salesman for details or mail the coupon.

Steel

Strong, Modern, Dependable

REPUBLIC STEEL CORPORATION
DEPT. OG-1835
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:
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☐ Republic Light Wall Line Pipe
☐ Alloy Steels ☐ Containers ☐ Metallurgical Service

Name_____ Title_____

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REPUBLIC STEEL

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the head's split hangers. No guide pins are needed.

One valuable feature of the tubing head is that tubing strings can be run and landed without removal of the blowout preventers. During removal of the blowout preventers and installation of the christmas tree, positive control of the well is maintained by multiseal rings on the hangers and removable full-opening back-pressure valves. Source: **Rector Well Equipment Co.,** Box 1286, Fort Worth, Tex., U.S.A.

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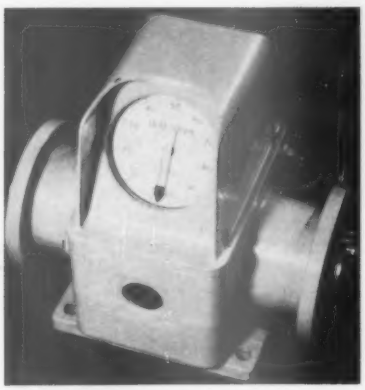


Little power needed to find torque

Power consumption of a new torquemeter is virtually negligible, the maker says. Capable of measuring torque at speeds from 0 to 25,000 r.p.m., this Model TMR-3 torquemeter gives continuous readings from 0 to 850 lb.-ft.

It can be fitted as a permanent attachment between the output shaft of the prime mover and the input shaft of the driven machine, using either a base-mounting or side-mounting flanges coaxial with two coupling shafts.

The torsion bar, through which all power is transmitted, has serrations at each end to engage with the two coupling shafts. The inner ends of the two shafts are provided with dogs or spurs permanently intermeshed with suitable clearances, so no weight is taken upon them unless the torsion bar fails or the torquemeter is overloaded. If overload occurs, the whole load is immediately taken on the dogs instead of on the gearing. Source: **Sir George Godfrey & Partners, Ltd.,** Hampton Road West, Hanworth, Middlesex, England.

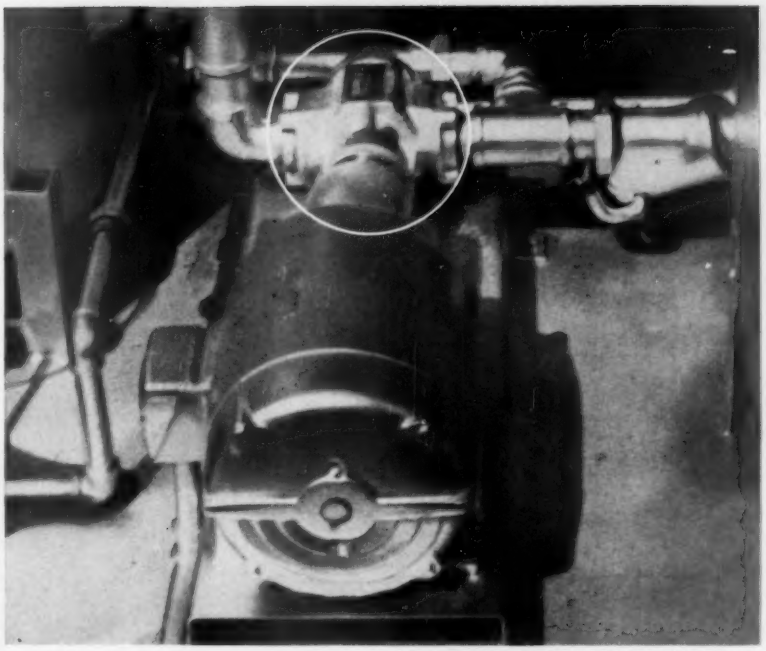


PHOTO COURTESY HY-BON ENGINEERING CO., MIDLAND, TEXAS.

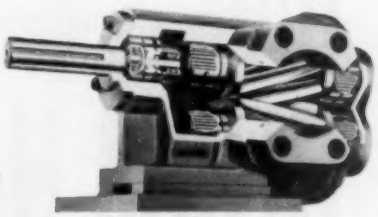
Brown & Sharpe Pumps cut costs four ways in L.A.C.T. units

1. Direct drive eliminates need for reduction equipment — means one less item to buy and service — less chance of breakdown.

2. Ceramic type mechanical seals last longer — require no adjustment.

3. Conversion for right- or left-hand rotation is easy. A B&S pump can be mounted to discharge either side . You just reverse a backdrain pin, when changing shaft rotation.

4. Dependability is built in through the use of close grain gray iron castings — hardened steel shafts and gears — heavy duty anti-friction bearings. Precision ground joints require no gaskets and hold internal clearances within precise limits. Replaceable wear plates and pipe connection flanges simplify servicing.



B&S Series 300 Rotary Gear Pump helps put the "automatic" in lease automatic custody transfer (LACT) systems.

Send for literature on B&S 300 Series and 700 Series petroleum-industry pumps. They'll save money and maintenance for you! Hydraulics Division, Brown & Sharpe Mfg. Co., Providence, R. I.

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from the NORTH POLE to the SOUTH SEAS

more than 20 mobile Decca chains are currently deployed throughout the world to cover air, marine and ground survey and exploration projects, providing the means of integrating land, sea and air operations. Recent developments have substantially improved the portability of the transmitting stations, which, with the receiving equipment, are simple to operate and interpret. Little maintenance is required and the system can be manned by non-specialists. The Decca service of men and equipment is available anywhere in the world at short notice. No other system provides continuous, high-accuracy position fixing on land or off-shore, with such ease and flexibility of operation under any climatic conditions. And, of course, over 7,000 ships and aircraft use the permanent Decca chains in Europe and Canada.

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THE DECCA NAVIGATOR CO. LTD. LONDON, ENGLAND

What's NEW

. . . in literature

Rigid plastic pipe

This corrosion-resistant pipe has applications in oil flow lines, crude-oil lines, and salt-water disposal. The four-page bulletin offers information on construction materials, tensile and impact strength, heat resistance, flow rate, and installation. Included is a description of five basic factory tests made on the pipe, along with a full page of specifications. Source: **Lasco Industries,** 1561 Chapin Rd., Montebello, Calif., U.S.A.

LP-gas carburetion systems

Operating characteristics of LP-gas, reports this six-page folder, have proved it the ideal motor fuel for performance and economy. The folder states that fleet users obtain the following benefits from using LP-gas: lower fuel costs, longer engine life, smoother power, and less down time. Comparisons are made between LP-gas and gasoline and diesel fuel. Source: **Marvel-Schebler Products Div., Borg-Warner Corp.,** Decatur, Ill., U.S.A.

Exhaust-heat-recovery silencers

According to this 20-page publication, internal-combustion-engine exhaust products usually represent from 20% to 90% of the total heat input. Some of this heat from engine or turbine plants can be recovered for crude, fuel-oil, or process heating. The literature features a series of steam-producing and water-heating exhaust-heat-recovery units, designed and built for specific requirements. Included are photographs, piping and control schematic drawings, and plant facilities. Source: **Engineering Controls, Inc.,** 611 E. Marceau, St. Louis 11, Mo., U.S.A.

Bulletin outlines automatic valves

This free 12-page bulletin contains information on: (1) pressure-temperature-relief valves for water; (2) relief valves for water heaters; (3) ASME pressure-relief valves;

Petroleum Storage Tanks of Greater New York Terminal, before backfilling operations. Coating Contractor: West Virginia Paint and Tank Co., Passaic, New Jersey.

Miles Howie, West Virginia Paint and Tank Co., says:

"You only get one chance on buried tanks and you'd better be right the first time!"

That's the way Mr. Howie, Manager of the coating application firm, summarized the approach to protection of these buried storage tanks for Greater New York Terminal. Mr. Howie continued, "We had to lick a serious corrosion threat from salt water penetration of the loamy dockside soil. The coating used had to stand up indefinitely, because of the prohibitive expense of excavating and recoating after the filling operation has been completed."

Bitumastic No. 50, a heavy-duty coating with excellent resistance to water absorption, was selected to protect these petroleum storage tanks, located at Greater New York Terminal, Inc., in Astoria, Long Island. Fast application and excellent bonding characteristics were additional factors in this coal-tar based coating's selection. As Miles Howie put it, "Based on our past experience with Koppers coatings, we know that nothing beats Bitumastic for this heavy service work."

You, too, can find a solution to your corrosion problem in the complete family of Bitumastic coal tar based coatings. For more information, call your Koppers representative or send the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto.

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COATINGS AND ENAMELS
another fine product of COAL TAR

KOPPERS COMPANY, INC., Tar Products Division
Dept. 104H, Pittsburgh 19, Pa.

Gentlemen:
Please send me more information on the Bitumastic family of protective coatings.

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Firm_____ Title_____

Address_____

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Field a powerful INTERNATIONAL team like this for servicing: Here's one good example, showing a model B-170 wire line unit (left) in action with a model RF-192 pulling unit.

Good example of a solid, dependable pumping operation: Here you see (left to right) INTERNATIONAL Models RDF-190, RDF-210-H and DCOF-417 teaming up on the job.

When the special equipment costs more than the chassis...

Oilmen depend on INTERNATIONAL Trucks for service in servicing problems

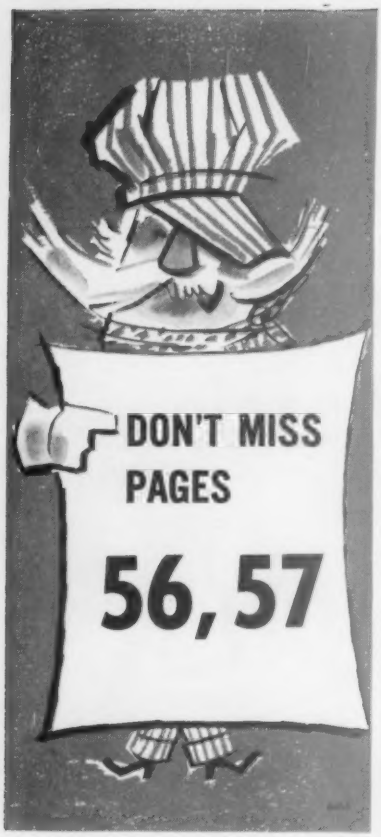
And this makes good sense, because INTERNATIONAL makes the most complete line of trucks for every function in oil field servicing operations.

When the biggest part of their time is spent at the well site, trucks for servicing not only have to get there, they have to perform when they do. They have to be built to take the pounding of long hours as stationary power units. And INTERNATIONAL Trucks can take it . . . they're built that way.

Increasingly, oil field servicing firms are finding that they can't beat an INTERNATIONAL Truck for adaptability, durability and dependability . . . and for the "guts" that other units can't deliver.

Why don't you take your servicing equipment problems to your INTERNATIONAL Dealer or Branch? You will find oil field specialists ready to help you engineer the truck application you need. International Harvester Company, Chicago.

INTERNATIONAL® TRUCKS WORLD'S MOST COMPLETE LINE IH®



(4) special-purpose relief devices; (5) pressure-reducing and regulating valves; (6) motorized-zone control valves; (7) boiler pressure valves; and (8) vacuum protective valves. Included are specification tables and shipping weights. Source: **A. W. Cash Valve Mfg. Corp.,** 666 Wabash Ave., Decatur, Ill., U.S.A.

Bearing material resists wear

Catalog 116A describes Vanco, a material designed specifically for use in applications requiring bearings, bushings, or rods, where corrosion and wear create problems. Composed of epoxy resin and glass fiber fused under heat and pressure, Vanco promises to prove useful in guide bearings, sleeves, and pumps. The four-page literature piece offers descriptions and specifications of the product, along with chemical, mechanical, machining, and physical properties. Source: **Van's Products Co.,** 8570 Hays St., Culver City, Calif., U.S.A.

Self-balancing indicators and indicator controllers

This newly released four-page bulletin explains operating principles, two or three-position control features, applications, small-space installation, servicing ease, and special design features of two models—potentiometer and bridge. Bulletin 67 provides information on components and features of the instruments. Photos are used to demonstrate the instruments' small panel-space-mounting requirements, servicing, adjustment, and ruggedness. The publication includes specifications on the sensitivity, accuracy, response speed, and operating requirements. Source: **Thermo Electric Co., Inc.,** Saddle Brook, N. J., U.S.A.

Gaskets brochure

This free publication is packed with information on gaskets for power and industry. It lists gasket styles, materials, and sizes available, and illustrates and describes ring gaskets, gaskets for heat exchangers, and cylinder-head and double-jacket gaskets. The literature details washers and shims, lead gaskets and parts, metal stampings, thread protectors, and cut gaskets. Included are four pages of data on circumferences and areas of circles and decimal equivalents. Source: **Chicago-Wilcox Mfg. Co.,** 7701 S. Avalon Ave., Chicago 19, Ill., U.S.A.

Bulletin details automatic flow responsive equipment for liquid feed systems

Just issued, Bulletin 1400.20-1 describes the Proportioneers Treet-O-Control Model 1410-1, a method of combining fluid meters and proportioning pumps so that a given process will be continuous, with all units synchronized and controlled from a single source. The four-page bulletin includes description, illustrations, charts, and dimensions. Source: **B-I-F Industries, Inc.,** Box 276, Providence 1, R. I., U.S.A.

Metal-sheathed thermocouples

These thermocouples provide a flexible solution to temperature-sensing problems when precision data is mandatory, according to four-page Catalog Supplement 161-A. It reports that up to six or more wires are encased in hard-compact-

"500 TON"
TOOL JOINT COMPOUND
"POLARIZED"
additive increases "clinging" power for greater thread protection under mud and water pressures!

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Specially designed and manufactured for storing sand samples. They will last and serve for years. Immediate delivery of any quantity.
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32 # KRAFT RUSTPROOF FLEXIBLE METAL TIE
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ed, high-purity alumina oxide, magnesium oxide, or zirconium oxide and are sheathed in metal to meet ISA accuracy. The bulletin offers outstanding features, specifications, and ordering information. Source: **Harco Laboratories, Inc.,** 77 Olive St., New Haven, Conn., U.S.A.

Anti-corrosion paints

THREE NEW CATALOGS—61A, 61B, and 61C—are now being offered free upon request to interested persons. The first describes technical features of how lead suboxide (Pb_2O) is employed in metal-protective paints to produce rust-inhibitive coatings with simplified maintenance. Catalog 61B shows colors for rust-inhibitive primers and finishes used in heavy industrial areas. It includes self-priming one-coat paints for metals. The third literature piece presents 10 deep-tone colors and 10 pastel colors—all paints with rust-inhibitive lead-suboxide bases used for color styling plants and machinery. Source: **Subox, Inc.,** Fairmont Plant, Hackensack, N. J., U.S.A.

Simplified connecting and sealing

Eight-page Bulletin WB-1, entitled "How, When, and Why to Use a V-Band Coupling," explains how the fastening of a V-band can improve functional design and product appearance, decrease assembly time, and cut manufacturing costs. The booklet illustrates some available coupling and flange configurations. It explains the sealing principle and shows typical V-band applications. Source: **Marman Div., Aeroquip Corp.,** 11214 Exposition Blvd., Los Angeles, Calif., U.S.A.

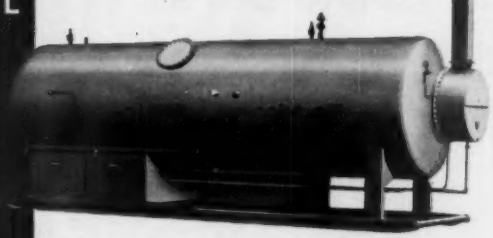
High-resistant protective coating

Bulletin M-5 introduces Plasite No. 7111, for use primarily as a tank lining for fuel and solvents. A crosslinked epoxy-phenolic formulation with a high ratio of phenolic, the coating is cured with an alkaline curing agent. The publication describes Plasite and includes physical specifications, zone of usage, chemical resistance, and application procedure. Source: **Wisconsin Protective Coating Corp.,** Green Bay, Wis., U.S.A.

SAUDER HT-TREAT PAK

ALL-PURPOSE ECONOMY for Toughest Treating Problems!

Oil Emulsion Treater



Sauder's HT-2 incorporates new design developments that assure automatic – fool-proof – operation – under all climatic conditions!

MEETS ALL OIL EMULSION TREATING REQUIREMENTS!

■ Operates as pressure treater – with or without gas. ■ Changes from gas to hydraulic delivery – without manual adjustment. ■ Handles water flood operations ideally. ■ Treats very toughest emulsions – with top economy!

New concept in furnace design minimizes coking, scaling, corrosion, and firetube burn-out – and, thanks to new method of heating directly in the oil – little (or no) heat is dissipated to free water!

TREAT PAK – PLUS INSTALLATION – COST LESS THAN OLD-STYLE EQUIPMENT! All controls and piping assembled at factory! Only four field connections required! Skid-mounted for fast – flexible – installation!

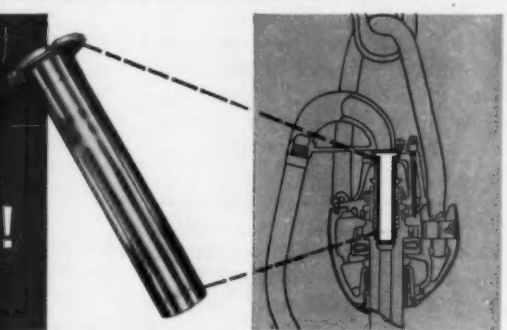
Write or phone us today for full information!

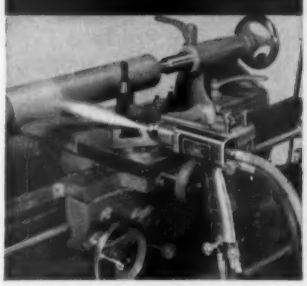
Sauder

SAUDER TANK CO., INC., Phone DI 2-2550, Emporia, Kansas

"Originator of 'ECONO-PAK & UNIDRYER'."

Everlasting Wash Pipes!





The Colmonoy Spraywelder is used to hard surface lathe-mounted oil field parts. After application, alloy is torch fused creating a welded bond between overlay and base metal. Alloy in rod form is used to overlay irregular surfaces.

COLMONOY HARD SURFACING CUTS WEAR—CAN BE APPLIED TO PARTS REPEATEDLY

"Wash pipes can be hard surfaced and returned to service again and again"—that's the report of Richco Metal Spray Co., Torrance, California. Application of Colmonoy No. 6 alloy with the Spraywelder is quick, and it offers better resistance to abrasion/corrosion than chrome plated, flame hardened, or carburized surfaces. Colmonoy hard-surfaced wash pipes provide up to 3 times more service life than new pipes– yet they cost 1/3 less!

Write us about your particular abrasion / corrosion problem. We'll recommend the proper alloy and even suggest a shop doing Colmonoy work near you. Get the Colmonoy Manual and Spraywelder Catalog.

HARD-SURFACING & BRAZING ALLOYS

WALL COLMONOY CORPORATION

19345 JOHN R STREET • DETROIT 3, MICHIGAN

Buffalo • Chicago • Houston • Los Angeles • Morrisville • New York • Pittsburgh • Montreal • London, England

HEVIWATER
completion fluid avoids use of mud

Since inhibited Heviwater* is free of solids, it helps operators avoid problems such as pay contamination and the sticking of packers due to the settling out of solids.

Heviwater can be furnished pre-mixed or it can be mixed at the well site using rig equipment. Dowell supervision for mixing is available upon request at no cost.

This table shows the materials which can be used, in addition to fresh water and corrosion inhibitors, to provide various fluid weights of Heviwater:

FLUID WEIGHT (LBS/GAL) :	MATERIALS USED
8.33-10.0	NaCl
8.33-11.0	NaCl + $CaCl_2$
8.33-11.8	$CaCl_2$
11.8 -14.0	$CaCl_2$ + $ZnCl_2$

Heviwater can be made available wherever this type of completion fluid is needed. Ask your Dowell representative for full information. *DOWELL TRADEMARK

PRODUCTS FOR THE OIL & GAS INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

▶▶▶ Equipment Men Notes

Reed Roller Bit Co. names Roy A. Bolo to new post

As manager of sales engineering, Bolo will work primarily with the development of new applications for Reed products. He has had a 25 - year career in the petroleum industry, including both domestic and foreign operations. Bolo served as manager of operations for Southeastern Drilling Co. of Argentina prior to joining Reed.

Joseph A. Conlon is appointed vice president in charge of sales

. . . of Dayco Corp.'s Rubber Products Division, succeeding Robert G. Burson who resigned. Previously marketing manager of the division, Conlon now has responsibility for sales, advertising, sales promotion, and merchandising for a group of diversified products.

William H. Jaynes is elected vice president, general mgr.

. . . of the Protective Coatings Division of Pittsburgh Chemical Co. He has served as general manager of the division since joining the company earlier this year. Jaynes is now responsible for all operations of the division, including production, marketing, sales, and distribution of products.

Texsteam Corp. acquires product lines of Accessory Products Co.

Texsteam will transfer manufacturing from Apco's Whittier, Calif. plant to its own plant in Houston, it was announced by J. P. Turner, vice president and general manager of Texsteam. The newly acquired natural-gas-equipment includes the Jet Stream gas - pressure - reducing regulator and the Check Stream dump valve. Apco is a division of Textron, Inc.

Texsteam, a subsidiary of Vapor Heating Corp., Chicago, has two sales divisions. Products distributed by its Pump & Valve Division, which will absorb the Accessory Products Co. line, have wide distribution in the oil, gas, and chemical industries. The Steam Generating & Heating Equipment Division distributes equipment for a variety of commercial, industrial, and processing applications, as well as for use by oil and gas-producing and transmission industries.

Richard P. Klopp becomes vice president of sales

. . . and a director of Catalytic Construction Co., moving up from his former job as general sales manager. Klopp joined Catalytic as a chemical engineer in 1952. Prior to becoming general sales manager last February, he had successive assignments in process and project engineering, project management, and was Gulf Coast area sales manager and manager of commercial sales.

Dr. Richard Kerr assumes title

. . . of product manager — epoxies and plasticizers in the new-chemicals group of Union Carbide Chemicals Co. Previously he was product manager — urethane intermediates. In his new assignment, Dr. Kerr will be responsible for the market development of epoxies and plasticizers and other products derived from peracetic acid or related to reinforced plastics. He joined Union Carbide in 1956.

25th ANNIVERSARY of the founding of Smith Tool Co. is being observed this year. A division of Smith Industries International, Inc., the Compton, Calif. firm manufactures jet rock bits for drilling. Originally established in 1936 as H. C. Smith Tool Co., the concern acquired its present name in 1959, after company stock was placed on the open market. The organization is headed by the executive officers of Smith Industries, from left: Donald E. Graham, president; H. C. Smith, chairman of the board; Arthur S. Marshall, vice president in charge of sales; and Kenneth H. Swart, executive vice president and general manager.

M. W. Kellogg Co. appoints two

James L. Patton takes over as manager of the Refinery Process Division, in which capacity he will be responsible for economic and

J. L. Patton

Leo Friend

technical evaluation and development of process designs for complete refineries and refinery units. A member of M. W. Kellogg since 1944, Patton previously served as refinery-division process manager and, more recently, as manager of the Chemical Process Division.

Leo Friend has been appointed director of chemical-engineering development and will manage the pilot plant, process development, and technical-data groups of the worldwide engineering and construction organization. Friend joined M. W. Kellogg in 1934. Prior to this appointment he served as an associate director of chemical engineering.

Tex-Tube, Inc. purchases Industrial Waterproofing Co.

. . . a Houston firm that sells and applies a variety of waterproofing and corrosion-resistant materials for coating of tanks, pressure vessels, process lines, and various types of industrial equipment. Tex-Tube plans to operate the company as a separate division and expand Industrial Waterproofing's sales and services within the petroleum and chemical industries. Lester Brusse, president of Industrial Waterproofing, will remain with the company as manager of the new Tex-Tube division.

Texas Instruments, Inc. elects 10 officers to new positions

. . . and reassigns individual responsibilities, according to President P. E. Haggerty.

The officers, their new titles, and areas of responsibility are: Mark Shepherd, Jr., executive vice president, with responsibility for all company operating activities; S. T. Harris, senior vice president, corporate

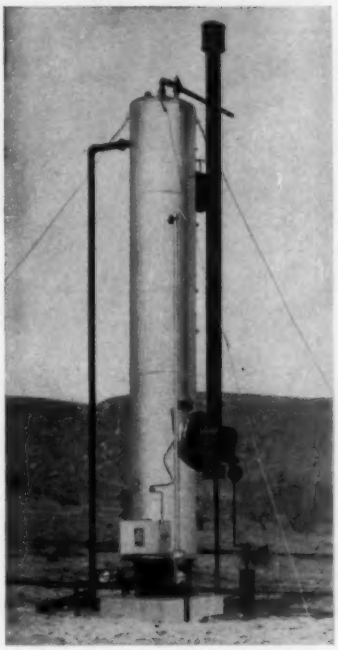
METROL® Metering Treaters

METROL® Metering Treaters provide efficient separation of oil and water emulsions and accurately measure the oil and water in two integral metering chambers in the lower portion of the vessel.

Metering Treaters achieve greater economy by incorporating several functions into a single vessel. A Metering Treater will serve as an Oil and Gas Separator, a Free Water Knockout, an Emulsion Treater, and Oil and Water Meters. Thus, a Metering Treater can be used in place of several other separate pieces of equipment to obtain savings in equipment cost.

Free Water removal in the upper separating chamber on these Metering Treaters is an optional feature. Oil-Water Interface Control in these units is maintained by a Weir or by Float-Operated Pilot and Valve.

METROL Metering Treaters are equipped with high capacity heating tubes that eliminate "hot-spots" and thus prevent fire tube failures. Also, these units are equipped with trouble-free and safe combustion control equipment to prevent "Blowouts" and "Flashback."



METROL Model 36 MT-0020 VWK Metering Treater

Emulsions in most areas can be treated by these units without excelsior. However, excelsior can be furnished in these Metering Treaters in case it is needed or wanted.

METROL's design experience, combined with qualified field service, assures the producer of dependable and trouble-free operation.

METROL Metering Treaters are available in either vertical or horizontal type of construction, and in working pressures of 25, 50, and 100 psi.

If you have an emulsion treating problem where you wish to meter the oil and water, you will save money by using METROL Metering Treaters. Please write us for details.

SPECIFICATIONS AND CAPACITIES

Outside Diameter	Shell Length	Heating Capacity BTU/Hr	Working Pressure psi	Capacities
3'	20'—0"	200,000	25, 50, & 100	Settling and metering capacities for these units will be furnished upon request
4'	20'—0"	400,000	25, 50, & 100	
6'	20'—0"	600,000	25, 50, & 100	
8'	22'—0"	1,200,000	25, and 50	
10'	22'—0"	1,800,000	25, and 50	

U. S. Patent No. 2,818,738 ® Trade Mark Registered U. S. Patent Office

We solicit your inquiries.

Every Unit is completely assembled, pressure tested, calibrated, and performance tested prior to shipment.

Competent Sales and Service Representatives located in all major oil areas.

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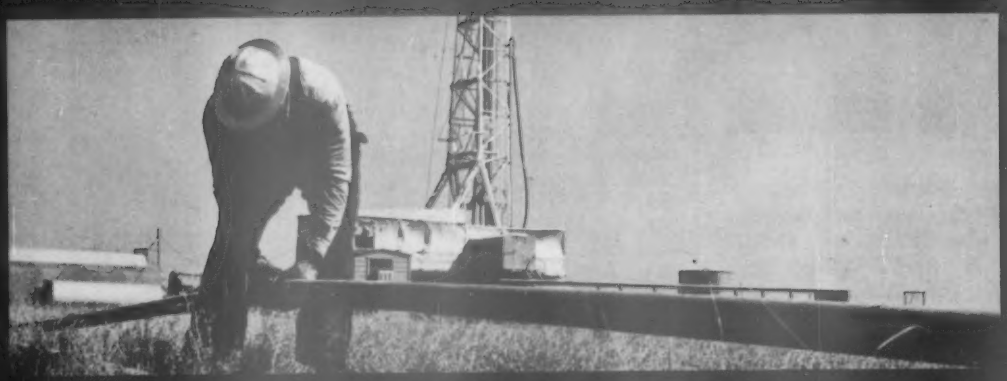
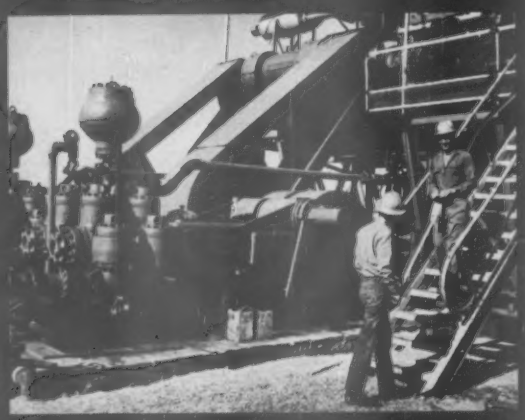
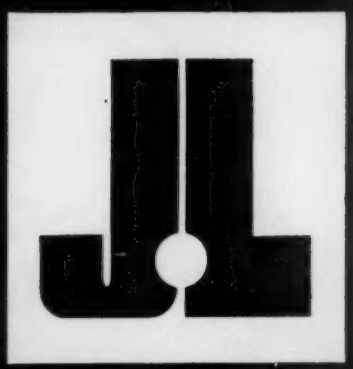


It pays to be curious . . .



Jones & Laughlin Supply Division « Tulsa



SUPPLY

. . . Bulletins for drillers

Want to know how two men using no tools can lay three miles of leak-proof McDowell "Fast-Line" pipe in one day? Gas, water, oil or air lines can be installed to your rig in short order.

Want to know why Gardner-Denver mud pumps step up drilling efficiency – why J&L drill pipe digs the world's deepest wells–and also saves on not-so-deep drilling?

It pays to be curious! Call your local J&L Supply man or write us at Tulsa, 1433 South Sheridan Road.

Jones & Laughlin Supply Division « Tulsa

development; C. J. Thomsen, senior vice president, financial activities and corporate communications; W. F. Joyce, senior vice president. the Apparatus Division and additional corporate responsibilities to be assigned later; Cecil P. Dotson, vice president in charge of the newly created International Division to encompass all overseas activities except those involved in geophysical operations; James R. McDade, vice president in charge of the newly created Transistor Products Division; Jay Rodney Reese, vice president in charge of the newly created Components Division; Bryan F. Smith, vice president in charge of corporate relations; H. J. Wissemann, vice president in charge of the government products group in the Apparatus Division; and George E. Livings, treasurer.

Schlumberger opens location

. . . in Brownfield, Tex. in an expansion of its logging and perforating services in the Permian Basin area. Office manager is R. D. (Dick) Knapp.

Plastic Applicators, Inc. names B. H. Pickard as sales director

B. H. Pickard

. . . according to Cordell Garner vice president and general manager of the Houston firm. In this capacity Pickard will direct all sales operations of Plastic Applicators and its wholly owned divisions, Rubbercap Division, Pipe Inspectors Division, and Plastronics Division. He had previously served as administrative assistant to the president. A veteran of 22 years in the petroleum industry, Pickard has worked in pipe-inspection operations the past 19 years.

Geraldo O. Penna named director of sales promotion

. . . for South American operations of Chicago Bridge & Iron Co., Chicago-based steel-plate fabricating and construction firm. Penna will be in charge of an area containing Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, Peru, and Uruguay. In addition to these new duties, he will continue as manager of Chicago Bridge Construcoes Ltda., CB&I's subsidiary in Brazil.

Penna has been with the CB&I organization since 1953. He started as a field-construction engineer and later served successively as a design, shop, and contracting engineer before being assigned to South America.

Keenan Pipe & Supply is named

. . . as distributor in Southern California, Arizona, Nevada, and Colorado for ACF lubricated plug valves manufactured by W-K-M Division of ACF Industries, Inc. Keenan will maintain stocks in Los Angeles, north Hollywood, San Bernardino, San Diego, Las Vegas, Tucson, Phoenix, and Denver.

R. L. (Don) Bowcutt rejoins

. . . Baash-Ross Division of Joy Mfg. Co. after a 6-year absence. He will be district sales representative for the northern Rocky Mountain area, according to W. Leo Cypher, Rocky Mountain area sales manager. Bowcutt will locate in Casper, where he has been affili-

Only R&M builds "ALL-WEATHER®" MOTORS!

"All-Weather" is a registered trademark for Robbins & Myers oil field motors! This means that only from R&M can you get this exclusive, fully-protected motor design which assures dependable, long-life service under all environmental conditions: wind-driven rain, dampness, corrosive atmospheres, hazardous condensation, dust and dirt. Write today for your copy of R&M's "All-Weather" motor bulletin 520-0G

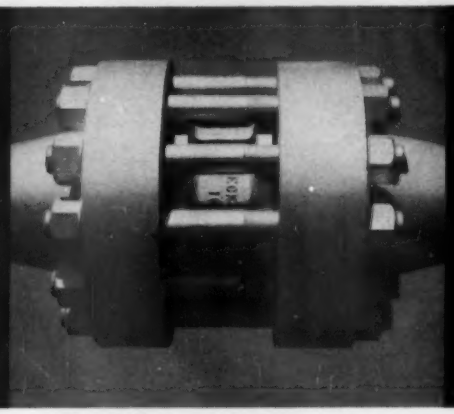
ROBBINS & MYERS, INC., Springfield, Ohio

Fractional and Integral HP Electric Motors • Electric Hoists and Overhead Traveling Cranes • Moyno® Industrial Pumps Propellair® Industrial Fans • R & M-Hunter Fans and Electric Heat • Trade-Wind Range Hoods and Ventilators

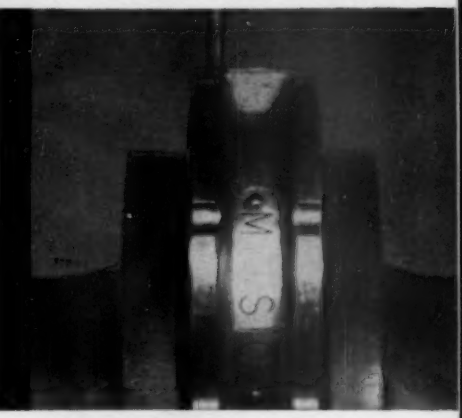
Subsidiary companies at: Memphis, Tenn., Pico Rivera, Calif., Brantford, Ontario.

COSTS LESS—WEIGHS LESS—EASY TO INSTALL

Because of its sound, imaginative design, the Duo-Chek check valve is smaller, uses less material, and costs less to buy. It costs less to maintain and lasts longer, too.

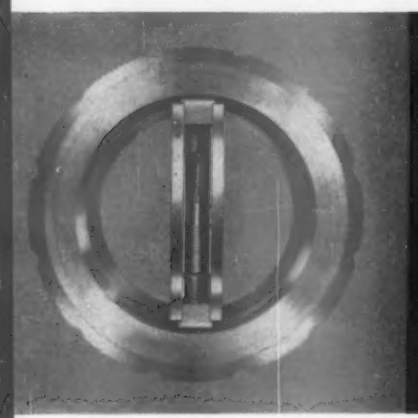


A Duo-Chek check valve weighs on the average less than ten per cent, with some models weighing only two per cent, as much as conventional check valves for the same service. No foundations are needed.

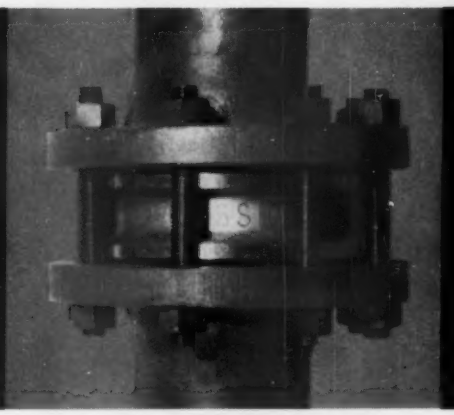


The Duo-Chek fits between the flanges, is smaller and weighs less. For example, a 6-inch steel valve, series 300, weighs 29 lbs., requires no special installation equipment.

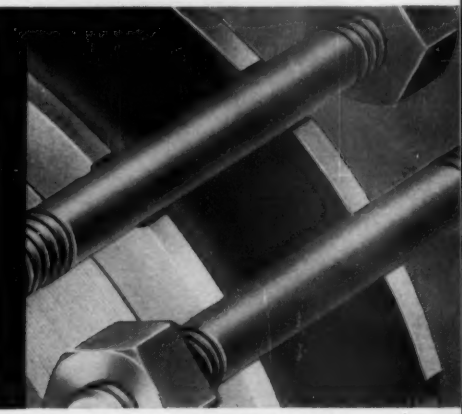
NO SLAM—ANY POSITION—CUTS INVENTORY



A stainless steel coil spring effects positive sealing action. The quick action of the spring closes the valve before reverse flow can occur. Result: No slam, no water hammer.



The Duo-Chek simplifies piping arrangements. The spring loaded plates operate in any position. Most popular sizes can be installed even in vertical lines with downward flow.



The unique versatility of the Duo-Chek greatly reduces inventory. In sizes 2 through 12 inch, one valve fits both series 150 and 300 flanges; 2- and 3-inch sizes fit series 600, too.

MISSION **DUO-CHEK** CHECK VALVE

The Mission Duo-Chek® check valve performs all regular check valve duties, yet is smaller, lighter, and easier to install. Duo-Chek check valves are available in a complete range of sizes from 2 to 48 inches, ASA Series 125 through 2500. They come in various end connections, such as raised face, ring joint, weld neck, etc. They are made in carbon steel, stainless steel, aluminum, and bronze. Special alloys are available. Because of the small size of the Duo-Chek, special alloy valves cost much less than conventional valves in the same alloy.

Sealing material is bonded in a groove in the plate. The sealing material makes an O-ring seal, which pressure deforms until metal-to-metal contact is made by the plate and body seat. Sealing material may be Buna-N, Teflon, Viton, or metal, depending on the service.

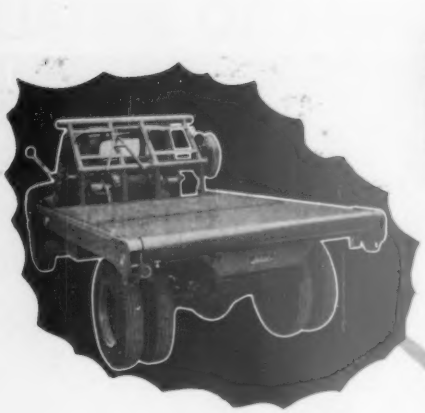
The simplicity of design of the Duo-Chek pays off in every installation with longer life and less maintenance. Only six parts are contained within the body of the Duo-Chek, held without the use of internal fasteners or joints of any kind. All parts are interchangeable.

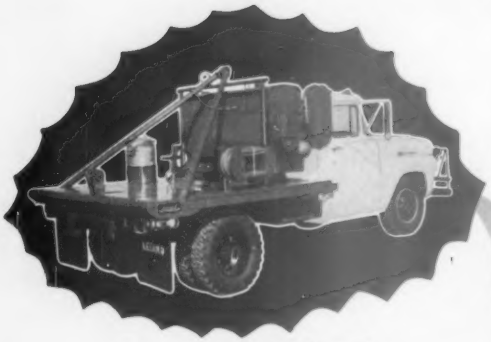
The Duo-Chek is much lighter in weight than conventional check valves, yet is stronger. By dividing the opening, the unsupported plate area is reduced so that each plate requires only one-eighth of the weight of a conventional clapper of the same strength. The short stocky body is inherently stronger and more rigid than a short length of heavy wall pipe.

Whatever your check valve application, the Mission Duo-Chek can cut initial purchase and installation costs, cut maintenance costs from then on. Contact Mission now for a representative.

MISSION VALVE AND PUMP CO. A SUBSIDIARY OF MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address 'MISSCO' • Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • Cable Address 'MISSOMAN' • Sold by Mission Manufacturing Company outside of Canada and the U.S.A.

MISSION VALVE AND PUMP CO.





OTHER LELAND PRODUCTS

Junior Packaged Unit ■ Fifth Wheel Body ■ Floats ■ Tilt Low Boy and Pole Trailers.

PROFITS GROW ON LELAND'S FAMILY-TREE OF-PRODUCTS

Profits grow as overhead shrinks when you use high-quality, low-maintenance Leland truck bodies—ideally suited to your needs — from Low Boys to Package and Welding units. ■ Leland's famous "Packaged Unit" is especially adaptable for pipeline and general oil field work. It includes Headache Rack, Rolling Tail Pipe, Gin Pole Pocket Settings, Flush Mounted Body Deck Plate and Winch Mounting Brackets. ■ Make oil field welding fast, simple and economical with Leland's new Welding Body. ■ Leland provides fast service and complete parts for Thew-Lorain . . . Gardner-Denver . . . C-M-C . . . Cleveland Trenchers . . . Tulsa Winches.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

CHARCOAL TEST METER

Light Weight and Rugged

The American® hardcase Charcoal Test Meter measures gas volumes in adsorption tests for determination of condensible hydrocarbons in natural gas.

Die-cast aluminum alloy construction provides high resistance to impact damage and makes this meter ideal for portable field service.

Rated capacity 100 cfh air at 1/2-inch w.c. differential. Maximum working pressure 5 psi. Meets AGA and NGAA requirements. Weighs just 17 lbs.

1/10 cubic foot index has 3-inch dial graduated in thousandths. Three totalizing hands read to 100 cubic feet. Hands are friction mounted for quick setting.

Request Bulletin 500 for complete specifications.

AMERICAN METER COMPANY

Sales offices in principal cities.

ated with the oil industry the last 13 years. He was formerly with Baash-Ross from 1948 to 1955 in district sales and as manager of the Rocky Mountain and Canadian areas.

J. J. Wall, Jr. is gen. sales mgr.

J. J. Wall, Jr.

. . . of Electric Machinery Mfg. Co., Minneapolis, succeeding the late H. W. Forschner. Wall joined E-M as a salesman in the New York territory in 1951. From 1954 to 1956 he was Cleveland district manager. In 1956 he became New York district manager, his most recent position.

Daniel E. Murphy becomes assistant to the president

D. E. Murphy

. . . of Consolidated Electrodynamics Corp., it was announced by Robert H. Garretson, president of the Bell & Howell subsidiary. For the past 18 months Murphy has been general manager of CEC's Datalab Division, which is now being integrated into other company operations. Murphy joined CEC in 1958 as administrative manager of Datalab.

C-E-I-R, Inc. opens London data-processing center

. . . according to Dr. Herbert W. Robinson, chairman of the board and president of C-E-I-R, Inc. The company's wholly owned British subsidiary, C-E-I-R (U. K.), Ltd., has charge of the new electronic data-processing facility which offers both IBM 7090 and 1401 computing systems, together with professional support.

Client work previously programmed in Great Britain and air-couriered to C-E-I-R computing centers in the United States will now be executed in London. C-E-I-R is an international electronic data-processing-service organization with headquarters in Arlington, Va., and C-E-I-R cen-

Hartzell REPORTS ON

Air Fin Cooler Fans in Germany

In Germany, the U.S. and around the globe, Hartzell cooling tower and heat exchanger fans are recognized for continuous, trouble-free performance.

At Esso's Refinery in Cologne, Germany, Hartzell six-bladed fan assemblies have been operating since November, 1958, delivering top-notch cooling performance.

Important reasons for this performance bonus are • AUTOMATIC AND INSTANTANEOUS CONTROLLABLE pitch settings that hold outlet temperature fluctuation to ±1½° F by increasing or decreasing blade pitch as cooling requirements change. • Up to 50% POWER SAVING since the pitch of the fan blades is rarely at maximum. • COMPLETE SIZE RANGE.

Whatever your requirement, look to Hartzell for your cooling tower and heater exchanger fans that cover every application. Write for bulletin A-111B.

Hartzell PROPELLER FAN COMPANY
PIQUA, OHIO
Engineering offices in principal cities
Div. of Castle Hills Corp.

FACTS FOR REFINERS

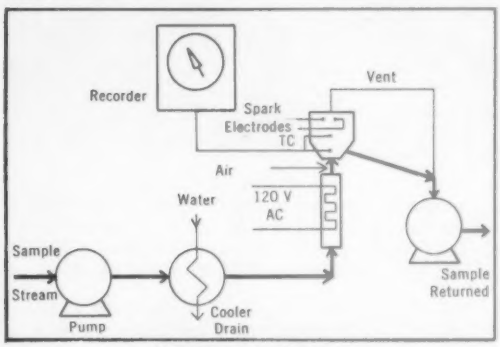
psd

INSTRUMENTATION FOR AUTOMATION

FLASH POINT CONTROL ADDS $45,625 TO ANNUAL PROFITS

American Oil Company told the API Division of Refining at its Mid-year Meeting, that *continuous* flash point testing adds $45,625 to the annual profit of a refiner producing 10,000 B/D of distillate fuels. No. 1 fuel oil can accommodate more heavy naphtha and total production can be increased about 5% by bringing the flash point 5°F. closer to specifications*.

Controlling flash point quality to the optimum level requires continuous monitoring, in contrast to normal practice of submitting only 1 or 2 stream samples once each shift to the laboratory. The CONTINUOUS FLASH POINT RECORDER, developed by Standard Oil Company (Indiana) and licensed exclusively to PRECISION SCIENTIFIC DEVELOPMENT, automatically determines flash every 5 minutes. Results correlate with ASTM Tag Closed test (D56) within 2°, and can be read immediately, enabling operators to pin-point the most effective process adjustments to virtually eliminate off-test production.



HOW IT WORKS

The flowing sample stream is first cooled, then its temperature is slowly raised; air is injected. Sample temperature is recorded electronically prior to exposure to high voltage sparks every other second. Following flash, recording pen automatically drops; cycle ends; 2-minute cooling begins, cycle recommences.

Continuous flash point control also gives more distillate production, to meet seasonally heavy demands, without increasing crude runs and processing costs. About 2000 B/D more crude would be required to provide 500 B/D more distillates. Increasing crude runs increases costs and aggravates the problem of maintaining balanced production. Flash point control also helps reduce other refinery costs, for example, if reprocessing of off-test material is reduced by 1% of total production, savings can amount to $20 per day . . . $7300 per year.

Typical Benefits of Flash-Point Control of No. 1 Fuel Oil

	B/D
Nominal Production	10,000
Added production by 5°F. lower flash point	500
	Dollars
Differential value of added stock, per bbl.	0.25
Value of 5°F. lower flash point, per day	$125.00

Other CONTINUOUS FLASH POINT RECORDER advantages are savings in time and protection against hidden errors and contamination. Process decisions can be made promptly and blending operations speeded by virtue of the continuous record and elimination of delays. Samples are taken directly from a process line, excluding sampling errors. The recorder eliminates oral reporting of test results, avoiding transcription errors. When used to monitor bulk deliveries of products to pipe line or tankers, it safeguards against leaky valves, poor mixing and contamination.

Refiners should study how the CONTINUOUS FLASH POINT RECORDER can add to profits. Request Bulletin No. 702. Let us help solve your special problems.

*PROCESS MONITORS SAVE MONEY AND IMPROVE EFFICIENCY
S. F. Kapff and R. B. Jacobs
American Oil Co., Whiting, Ind.

Precision Scientific Development
3745 West Cortland Street
Chicago 47, Illinois

ters in New York City, Boston, Hartford, Houston, Los Angeles, San Francisco, London, and Paris.

Milan F. Ondrus becomes

. . . staff assistant to the general sales manager, European area, of Dow Chemical International, Ltd., S.A. He was formerly manager of the public welfare relations and advertising department of Dow International, in Midland, Mich. In his new assignment, Ondrus will handle marketing projects and report to Charles M. Doscher, general sales manager of the European area.

Assuming Ondrus' previous job in Midland is Alex Crossan, Jr. A Dow employe since 1956, Crossan's first assignment was in chemical sales. In 1959 he was transferred to Dow International, and his most recent position was assistant manager of the public relations and advertising department.

Continental-Emsco Co. opens

. . . a new oil-field-supply store at Poteau, Okla., stocked with supplies to serve drilling contractors and oil producers in the area. J. J. Barnett is manager of C-E's new store, and Wardie Hiler will be field salesman. Otis Tubbs, district manager at Oklahoma City, is in supervision of the store, which is a part of the company's Oklahoma-Kansas division.

INTERNATIONAL GUESTS at the recent meeting of the Houston Nomad Chapter were, from left, standing: Maurice Galtier and Girrard Saul, Lanque Docienne Drilling Co., Paris, France; and W. R. Rieter, Reed Roller Bit Co., Beirut, Lebanon. Seated, from left, are: Arturo Moretti, Empresa Petrolera Fiscal, Talara, Peru; Robert Rieter, Houston, and Maurice Bove, Forex Drilling Co., Paris, France.

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HERCULES OIL RESERVOIR UPPER GLAND

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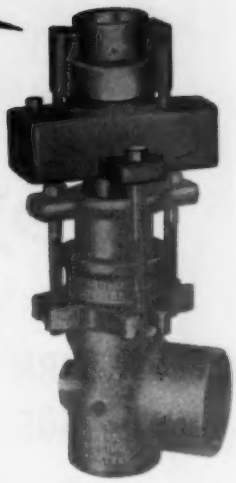

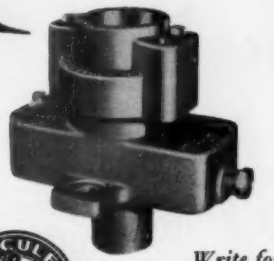

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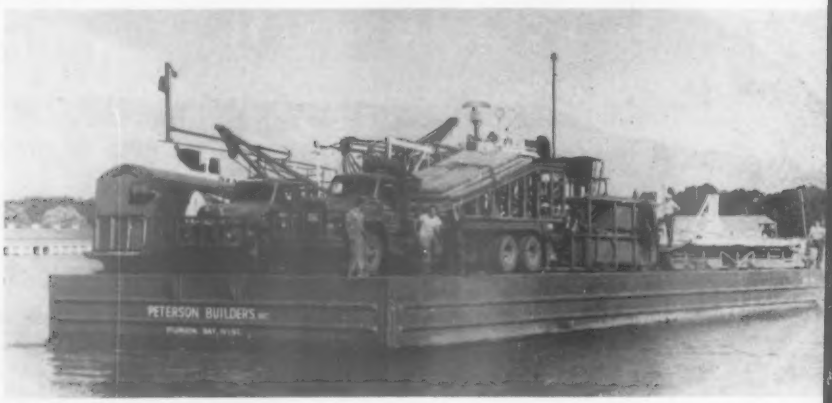

LOADED BARGE with drilling equipment at Charlevoix dock is being nudged out of harbor for 6-hour tug haul to St. James on Beaver Island. Four trips were required to move entire rig and supplies.

Michigan's Beaver Island is busy

OFF NORTHERN MICHIGAN an island in Lake Michigan is feeling the bit for the first time. At this on-land-offshore drill site, Beaver Island is the locale for the activity. Normally, the summer brings only tourists but this year it is being invaded by men looking for oil.

Beaver Island isn't very large despite the fact that several other water-locked pieces of land are in the general vicinity. In the island group, Beaver is the largest with a length of 13 miles and a 6-mile width.

During the summer months, a commercial ferry from the town of Charlevoix makes the 32-mile trip to the north end of the island to St. James. However, the drilling firm, McClure Drilling Corp. of Mount Pleasant, Mich., decided to obtain special equipment to transport the drill to the site.

The contractor used a tug and barge to carry the drill and its equipment to the island. The 100-by-40-ft. barge took about 6 hours one way to make each trip and four loads were required in all to get all equipment and supplies (except fuel) across the water.

Proposed depth for the first test will be between 3,500 and 4,500 ft. which it is estimated as sufficient to reach the potential pays. Possibly two more wells will be drilled on the island if conditions are right.

Perhaps the most significant thing about this operation is the imagination and planning it took to initiate and execute the venture. For further information about the busy island, see Page 205 of this issue.

SUPERVISING loading operations (from left) are Roy Raines and Dean Russell, Nelson Trucking Co.; and William Primm and Eddie Trudeau, McClure Oil Co.

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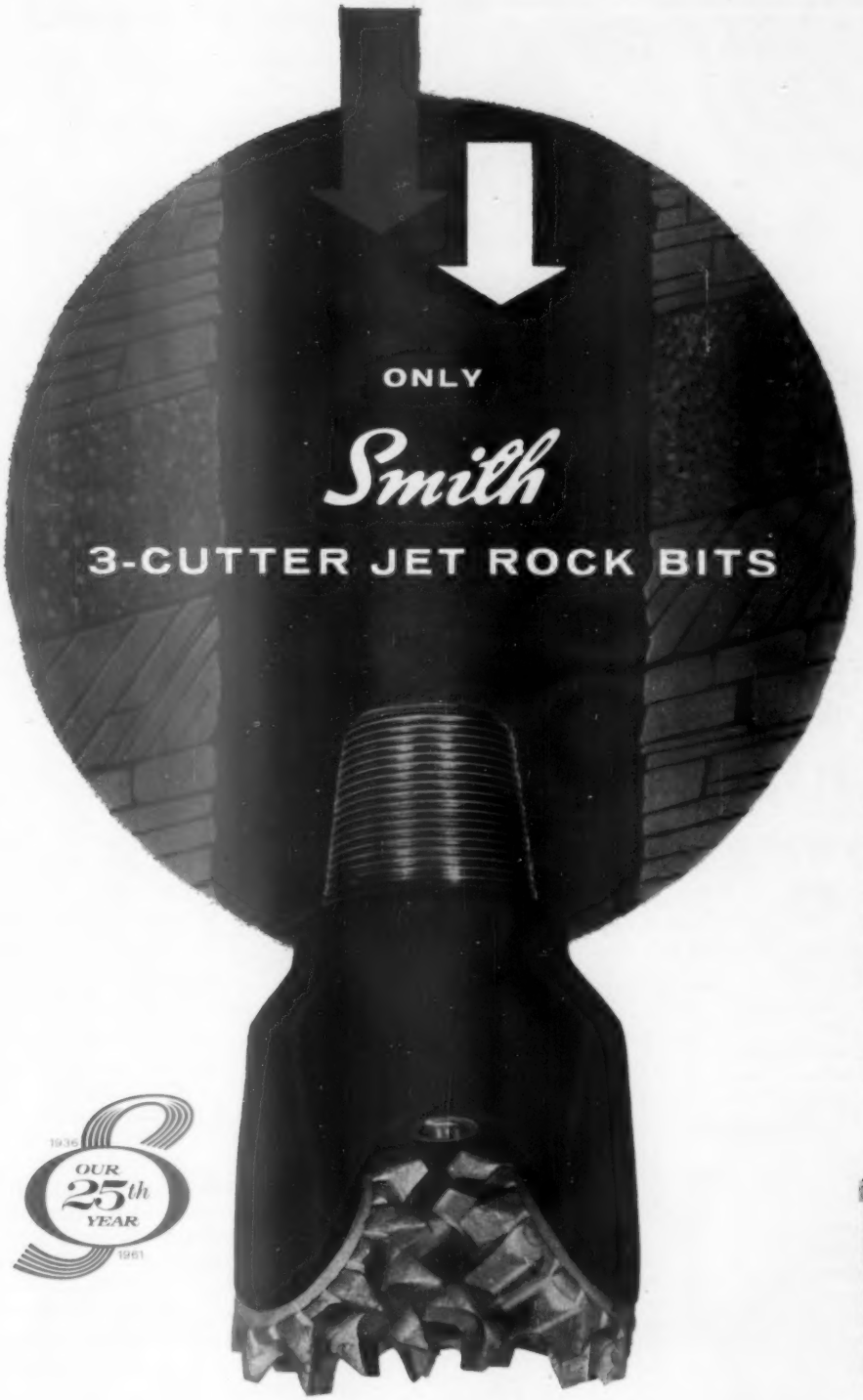

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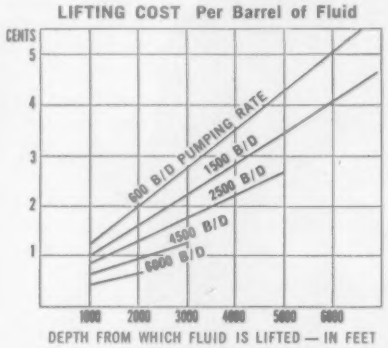

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New text proposed

AAODC has received a proposal from General Preston A. Weatherred to write a permanent text on the federal wage and hour law. Weatherred also plans to develop a supplemental service along with the new book. Purpose is to better acquaint the oil-well-drilling industry with employment practices and the supplemental service it is felt necessary to keep abreast of amendments, court decisions, administration interpretations, and regulations of industry experience under the law.

In past seminars held by AAODC for management, General Weatherred prepared and presented the material pertaining to the federal wage and hour law. More than 250 management people in 14 locations have attended these meetings.

In the past, notebooks covering the phases of the law from regulations were given to each conferee and during the ensuing discussions related to practices, some interesting examples were presented by the conferees. Weatherred took careful notes of the various practical problems presented and it is now felt that a wealth of experience in case histories has been accumulated. Not only were the problems and their applicable laws and regulations recorded, but the advised solutions are included.

The new book will be made up of four sections. The first pertains to basic provisions covering definitions, explanations, practical application, illustrated examples, and references to supporting data given in the next three sections.

The second section is about supporting authorities. It cites law, court decisions, and the interpretation of regulations. Included are official correspondence, letter opinions, and briefs.

The next section is devoted to approved forms. Special employe-contract records required of employers, and government forms are the three main subdivisions.

The last portion of the text cites industry practices in relation to the wage and hour law. Specifics are normal organization and flow of authority, job descriptions, and employes' activities in relation to exemptions and methods of compensation.

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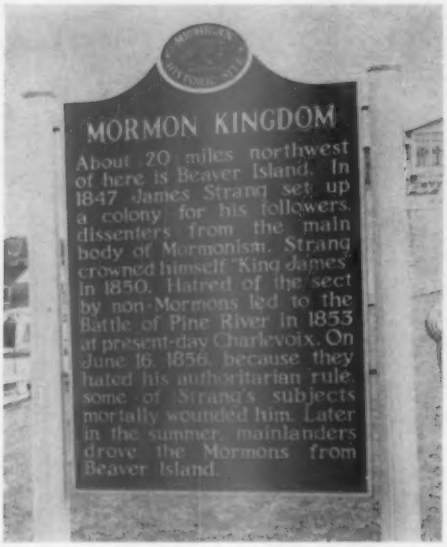
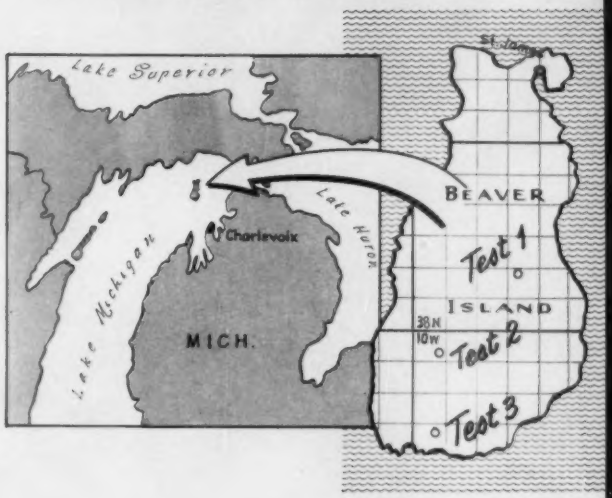

MORMON KINGDOM
About 20 miles northwest of here is Beaver Island. In 1847 James Strang set up a colony for his followers, dissenters from the main body of Mormonism. Strang crowned himself "King James". In 1850, Hatred of the sect by non-Mormons led to the Battle of Pine River in 1853 at present-day Charlevoix. On June 16, 1856, because they hated his authoritarian rule, some of Strang's subjects mortally wounded him. Later in the summer, mainlanders drove the Mormons from Beaver Island.

THIS HISTORICAL marker at left, at Charlevoix, Mich., points the way to Beaver Island where McClure Oil Co. of Scipio-trend fame will drill three wildcats. The three tests are looking for Trenton-St. Peter on the very edge of the Michigan basin, as shown in the map at right.



Busy Beaver Island draws three wildcats

FIRST EXPLORATION for oil and gas on Michigan's Beaver Island, a 13-mile-long by 6-mile-wide island in Lake Michigan, has begun. McClure Oil Co., of Alma, Mich., plans to drill at least three wildcats on the island this summer. The first test spudded in on July 27. McClure Drilling Corp. of Mount Pleasant, Mich., will do the drilling.

The objective. Target for this "drilling first" is the Trenton-St. Peter section, expected at from 3,500-4,500 ft. At least one of the trio of tests will go to granite.

The first wildcat is the 1 State in NE NW NW 27-38n-10w, Peaine Township, about 20 miles from Charlevoix County, on the mainland of Michigan.

At a summer resort. Beaver Island is known to Michigan folk as a summer resort slightly south of the northern straits tip of the Lower Peninsula. The island, part of Charlevoix County, has about 150 year-around residents. Half of the island is under state ownership. The rotary-drilling rig was moved to Beaver Island by tug and a 40-by-100-ft. barge from Charlevoix to St. James, 32 miles and 6 hours away sailing time. Drilling equipment was moved in three bargeloads and a fourth barge trip took the cement truck, casing, mud, and other gear. Fuel comes to the location via the Charlevoix ferry which runs once daily.

Climaxes a rush. Interest in the northern reaches of Michigan has been on the rise since last summer when oil companies and individuals leased up thousands of acres. So far there has been little drilling in this northern country where the Trenton may run from 4,500-7,500 ft.

DRILLING EQUIPMENT is loaded on a barge for 6-hour tug haul to St. James on Beaver Island. Four trips were required to move entire rig and gear.

EXPLORATION continues in the nation where sand is the surface formation in much of the country. Here a seismic party plants a geophone on a reflection spread.

Libya still holds promise - - and problems

● Vast reserves are due if the past 3½ years are any indication of things to come. However, changing rules for concessions and unfinished facilities are deterrents.

BY PETER BIKE
Geophysical Editor

OIL, OIL, EVERYWHERE, nor any drop to sell. A paradox for Libya? Not quite—the young independent nation whose oil industry is sprouting like a healthy weed is having its problems.

The striving embryo government is changing its thinking and its rules to the point that some oil men liken the situation to a poker game with chips that can't be cashed in until next year. For it's likely that next year is the earliest that the oil can be moved to market.

Both pipeline systems, refining, and docking facilities will become a reality in several months. Concessions are still being granted, though the terms have changed a little, and over-all government policies are undergoing revision. This is natural for the tyro nation whose petroleum laws were passed on June 19, 1955. All in all, there is a rising tide of deep-felt nationalism and pride permeating the populace.

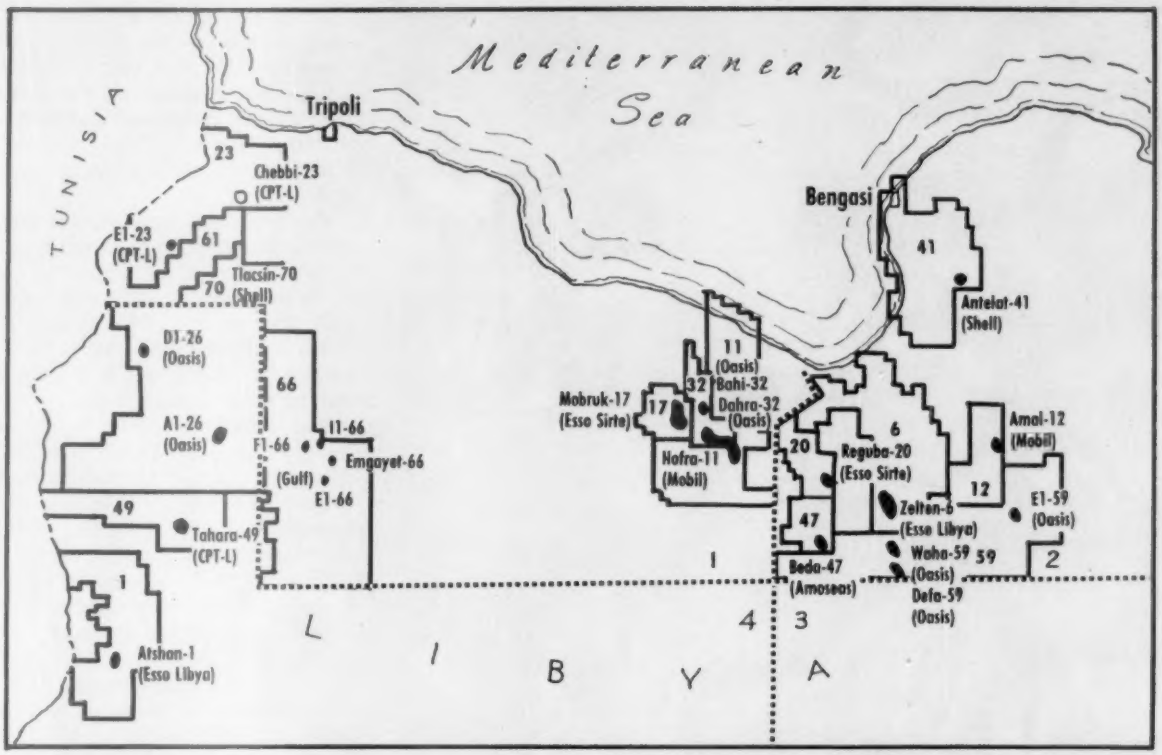
Meanwhile, the sparsely populated (1.2 million) nation is capable of producing 152,000 bbl. daily. The only thing lacking is a way to move the oil, and until that time all wells are shut in.

Does this dull some of the luster for oil hunters? Not at all—Libya is better than ever. Few areas in the world have greater potential and, save the Middle East, can match Libya's success ratio in drilling. To date it approaches 40% for all wells.

Exploration goes merrily along and for the last full year (1960) all records were shattered with a total of over 1,200 crew-months which doesn't include base-line surveying, astrofixes, electrical surveying, nor mine-clearance work.

Concessions. The Libyan Government initially granted concessions with the provision that at the end of 5 years one fourth of

Photos were provided through the courtesy of British Petroleum Co., Ltd.



THESE concession blocks are ones which are capable of present or potential production in Libya. It is significant that most of the oil found to date is in the northern sector of the country nearest to the sea.

the acreage must be released. Exploration had to start within the first 8 months along with other stipulations of bonuses, rentals, and an equitable 50-50 profit split.

Here are the terms of the initial law: Libya is divided into four zones: Zone 1 is the Province of Tripolitania in the northwest; Zone 2 is the Province of Cyrenaica which lies north of the twenty-eighth parallel in the northeast; Zone 3 is that portion of the Province of Cyrenaica which lies south of the twenty-eighth parallel in the southeast; and Zone 4 is made up of the Province of Fezzan mostly south of the twenty-eighth parallel in the southwest.

All concessions are granted up to a period of 50 years and are renewable for a period not to exceed a total of 60 years. Any company is limited to three separate concessions in zones 1 and 2 not to exceed 30,000 sq. km. (11,600 sq. miles) and as many as four separate concessions in zones 3 and 4 not to exceed 80,000 sq. km. (31,000 sq. miles).

POTENTIAL PRODUCING AREAS OF LIBYA

Area and operator—	Discovery well	Block	Completion	TD, ft.	IP, BOPD
Atshan, Esso Libya	B2	1	1-58	2,960	500
Bahi, Oasis	A2	32	7-58	6,100	500
Dahra, Oasis	B1	32	11-58	4,940	500
Tahara, CPT-L	B1	49	12-58	7,587	100
Zelten, Esso Libya	C1	6	6-59	5,676	17,500
Oued Chebbi,* CPT-L	A1	23	7-59	7,300	†0.01
Mabruk, Libyan American	A1	17	7-59	5,800	600
Emgayet, Gulf Libyan	A1	66	9-59	7,944	800
Beda, Amoseas	B1	47	9-59	5,108	3,650
Tlacsin, Shell	A1	70	11-59	13,187	700
Amal, Mobil of Canada	B1	12	11-59	11,290	990
Block 66, Gulf Libyan	E1	66	1-60	5,498	176
Block 26, Oasis	A1	26	2-60	10,746	450
Defa, Oasis	B1	59	2-60	6,263	1,584
Block 66, Gulf Libyan	F1	66	4-60	8,405	1,200
Hofra, Mobil of Canada	A2	11	4-60	3,200	1,500
Waha, Oasis	A2	59	11-60	6,868	4,400
Block 66, Gulf Libyan	I1	66	12-60	5,326	650
Reguba, Esso Sirte	E1	20	1-61	5,480	2,250
Block 26, Oasis	D1	26	4-61	4,300	‡1,000
Block 59, Oasis	E1	59	5-61	3,200	1,500
Block 23, CPT-L	E1	23	6-61	11,485	1,900
Antelat,* Shell	B1	41	(?)	6,528	150

*Although not considered commercial, immediate adjacent area may prove productive. †M.M.c.f.d. gas. ‡Estimated.
Note: Dahra-Hofra may be a single field.

In zones 1 and 2, at the end of 5 years the area of the concession is to be reduced to 75% of its original size, at the end of 8 years it is to be reduced to one-half original size, and at the end of 10 years reduced to one-third original size. The same applies for zones 3 and 4 except that at the end of 10 years the area held is only one fourth of original size. No operator is required to reduce his concessions to less than 3,000 sq. km. (1,158 sq. miles) in zones 1 and 2, and to not less than 5,000 sq. km. (1,931 sq. miles) in zones 3 and 4.

The law also provides that up to 20% of exploration and development expenses could be deducted from gross income before production reaches 15,000 bbl. daily.

The government has a fixed

BREAKING CAMP, a British Petroleum field party packs up after spending the night at the last oasis before reaching Sebha, the capital of Fezzan.

royalty of 12½% and when daily production reaches 15,000 bbl., the law allows a depletion allowance of 25% of gross income, not exceeding 50% of the net, along with a 50-50 net profit split.

Competition changes terms. An interesting note occurred not long ago when some of the first concessions granted reached the end of the first 5-year period. The 25% of the block turned back to the government were offered for rebidding and some strange things resulted. Altogether, portions of more than 30 different blocks were released.

One week after the date for filing, an unexpected and disappointing quickie deadline was announced by the government. Several firms that wanted to bid on the tracts were caught flat-footed without warning and were closed out. The Libyan Petroleum Commission officers gave no reason for their unprecedented action and merely stated that the reserve tracts would be offered again with no date given. Of three firms that were vying for the newly offered areas, only two were successful. These were Phillips Petroleum Co. of Libya and Pan American Libya Oil Co. The unsuccessful applicant was Cia. Richerche Idrocarburi (CORI), an Italian firm.

There were several cases of multiple applications for the same tracts and Phillips ended up with newly designated Blocks 90, 91, and 92. Pan American was awarded Blocks 93, 94, and 95. Total area acquired by each was 3,970 sq. miles for Phillips and 3,230 sq. miles by Pan American.

Block 90 offsets a recent discovery by Oasis. The D1-26 tested an estimated 1,000 bbl. at 4,300 ft. To the southeast on the same block, Oasis completed a 450-bbl. potential at its A1-26 venture, which was completed early last year.

Much of the acreage granted was sirloin grade, if nearby production is any criterian. Phillips' Block 91 lie northeast of and along trend with the prolific Mabruk-Dahra-Hofra fields, and closer to the Mediterranean. Block 92 is on trend and between several fields.

Pan American didn't fare too badly, either. Its Block 93 is immediately adjacent to the east and south of Block 92, and west of the Reguba field opened by Esso Sirte at its El-20 which potentialled 2,250 bbl. daily at 5,480 ft. in January. Block 94 is northeast of Reguba and not too far northwest of Esso Libya's spectacular Zelten field. The third concession, Block 94, is more of an unknown but the best thing that can be said is that it's immediately west and northeast of Zelten.

In eagerness to acquire these blocks some new terms were involved. Pan American waived the 25% depletion allowance and boosted the royalty up from the customary 12½% to 19% on commercial production. Also, instead of the rental payment on exploration acreage of 5 pounds Libyan ($14) per 100 sq. km., Pan Am has agreed to 100 pounds Libyan ($280) per 100 sq. km.

At the end of 1960, there were approximately 260 million acres held by concessions. Following the releases a few months ago and the granting of only 6 of the more than 30 tracts that were turned back to the government, total acreage now held is believed to be less than 260 million acres. A check then showed that there were 19 firms holding concessions.

A good record. At last count there have been 244 tests drilled since 1956. These resulted in 88 oil wells, 6 gas wells, and 150 dry holes. There are at least 22 known potential producing areas and the largest field (Dahra) has over 40 wells. Production tests indicate that all Libyan wells have the capability of a total yield of 152,000 bbl. daily.

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HERE is a base camp from which a seismic crew operated while conducting surveys in the salt flats area in the Province of Fezzan.

WELL COMPLETIONS IN LIBYA

	1956	1957	1958	1959	1960
Oil	0	0	4	14	48
Gas	0	0	0	3	1
Dry	1	4	22	24	82
Total	1	4	26	41	131
Footage drilled	9,372	*29,186	156,868	343,321	923,868
Rigs running at year end	1	4	9	28	33

*Includes wells drilling but not completed.

EXPLORATION ACTIVITY IN LIBYA, CREW-MONTHS

	1955	1956	1957	1958	1959	1960
Surface geology	64	158	293	407	328	277
Seismic		24	106	233	312	477¾
Gravity	3	66	151	353	27	49¼
Magnetometer	9	4	48	72		9
Structure drill			23	24	8	388¼
Total	76	252	621	989	675	1,201¼

Yet the country has scarcely felt the drill bit. Larger than the combined areas of Alaska, Texas, and California, Libya has 1,100,000 sq. miles. Most of the drilling effort has been in the northern half of the country and the density is low. For all practical purposes, the southern half has escaped the drill. It is not likely that the southern area is considered of less potential than elsewhere, it's a matter of economics in getting any oil found transported out. Proximity of any prospect to the sea is still a dominent factor.

Exploration at high level. Since exploration began late in 1953, it has accelerated in pace ever since. Much of the effort is now seismic work where previously the emphasis was on aerial mapping, surface geology, and mine clearance. During World War II, it was estimated that 3 million land mines were planted in Libya by German and Allied troops.

Initial effort was concentrated on apparent surface structures in the provinces of Tripolitania and northern Cyrenaica. Later, with the use of gravity and magnetics, surface work was supplemented. Last year, seimic exploration became the leading tool. It is interesting to note that after a substantial amount of exploration work was done, the first discovery was made in 1958. Now after a lapse of a couple of more years, the success ratio is booming. If one were to relate the exploration to the discoveries, it is noted that the time lag in Libya is shorter than many other regions of the world.

A commonly accepted lag of 3 to 5 years is considered par for a new region. A safe estimate is that in Libya that the time lag between the starting of field work and a successful well completion is 1½ to 2½ years. Perhaps this is due to the fact that in 5 years one-fourth of the acreage must be released and the main objective is to evaluate each concession as rapidly as possible, so one will know what to keep. This may indicate that all the plum prospects will be found first, and the dogs and second-grade features will be completely bypassed. If the present trend persists, some of the second-rate prospects will be found and developed in the north before the south is tackled at all. One can't help thinking that the vast sandy wastes of the south are bound to yield oil, if only because the country doesn't look good for much else.

What's ahead? There's a lot of glitter left in Libya. Two pipeline systems will be completed by next year. Esso Standard will build a 110-mile 30-in. line from Zelten to the Cyrenaican coast at Marsa el Brega. Rate will be 150,000 bbl. daily by gravity flow (see OGJ, Jan. 16, 1961, p. 45).

Oasis has proposed to build a 30-in. line from Dahra field to the coast at Es Sider, a distance of 85 miles. A 36-mile 20-in. feeder line will connect Mabruk and Bahi fields to the main line. This system will have a top capacity of 300,000 bbl. daily. Esso Sirte and Libyan American will join Oasis in the pipeline venture, so these firms can further develop Mabruk, Bahi, and Dahra fields.

Esso Sirte proposes a 6,200-bbl. per day refinery at Marsa el Brega. Esso Libya has shipped equipment to Zelten field which will handle a production capacity of 200,000 bbl. daily. The firm also plans to expand moorage facilities at the seaport.

The three partners of Oasis will make separate plans to market the Libyan crude. Continental has already bought about 360 service stations in West Germany and Austria. Ohio is proposing to build a 25,000-bbl. per day refinery in Spain in conjunction with a Spanish firm. Amerada, the third Oasis partner, has not disclosed its plans.

Despite the fact that only three

firms bid on over 30 blocks of released acreage this spring under rather unusual circumstances, there appears to be no lessening of interest in Libya. There are now 20 firms operating in the country and soon another will join the throng. National Oil Co. of Libya, comprised of several partners (see OGJ, July 17, 1961, p. 41) has announced plans to seek concessions. At last report, Kewanee Oil Co. will operate for this group.

Look for increased activity and more significant discoveries in the months ahead. It is likely that interest will shift farther south during the next few years and zones 3 and 4 will bear more of the brunt of the drilling. Despite the problems, Libya is **still** a good place to find oil.

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New gas discovery finaled in Vermilion Parish, Louisiana

Vermilion Parish in southern Louisiana has a new gas-producing area at George R. Brown 1 Agnes LeBoeuf, ¾ mile from production at Abbeville field. The well is completing at 13,172-74 and 13,176-80 ft.

This new gasser flowed 5,067 M.c.f.d. and 60 bbl. condensate. Gas was on 12/64-in. choke. Location is in 31-9s-4e.

Lafayette Parish. Cyprus Oil Co. completed 1 James Boudreaux as an extension to the east of Scott field. The well flowed 20,098 M.c.f.d. from perforations at 11,092-11,106 ft. plus 18 bbl. condensate. New well is in 31-9s-4e, 2¼ miles from field production.

St. Mary. Diversa, Inc., completed 3 State Lease 2682 to extend East Lake sand field in St. Mary Parish about 1½ miles northwest. The well made 2,920 M.c.f.d. plus 72 bbl. condendate per day from perforations at 14,636-46 ft. on 12/64-in. choke.

North Thibodeaux. A new pay discovery in North Thibodeaux field, Lafourche Parish, flowed 2,700 M.c.f.d. from perforations at 10,784-90 ft. The well is Trice Production Co. 1 LeGarde in 67-14s-16e.

Michigan well taps oil

Western Michigan claimed some of the interest from the Eastern reef play as Flory and Hilliard 1 Hill, SW SW NW 26-15n-16w, Oceana County, recovered 75 bbl. oil in 14 hours, swab and flow from Traverse lime at 2,114 ft.

It was the seventh consecutive wildcat drilled the last 2 years by Flory Bros. and associates in the Elbridge township area. Pool prospect is located about 5 miles north of Ferry pool.

Sun Oil Co. 1 Walter, SE NE SE 22-1s-5w, Cal-Lee pool, Calhoun County, originally completed for 9 bbl. per day from Black River zone at 4,839 ft., is on test after plugback and perforating A-1 Sa-

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lina section at 3,068-80 ft. Well recovered 70 bbl. of oil and 140 bbl. of water first 22 hours on swab. If completed in present zone it will be first A-1 Salina oil production on Albion-Scipio trend.

Fain-Porter Drilling Co. 1 Neuman, NE SW NE 18-7s-13e, Mussey Township wildcat, St. Clair County, gaged 3,700 M.c.f.d. gas from Niagaran after acid-fracture. Pay is from 4,550-86 ft. Gas discovery prospect is 8 miles north of Berlin oil pool. Fain-Porter and Sunray hold most of the acreage in the Mussey township area.

Good gasser reported at Ohio prospect

A semiwildcat by Ohio Fuel Gas Co. in southwest Benton Township, Hocking County, resulted in a good gasser.

The Clinton sand pay on 1 B. H. Starkey, Section 31, was from 2,413-20 ft. with 267 M.c.f.d. natural. Reported gage after fracture was 3,480 M.c.f.d. and rock pressure was 757 psi.

Atlas Exploration Corp. has a third successful offset to its Clinton pool opener in Smith Township, Mahoning County. This test, James Tennefoss, Lot 36, Deerfield Township, Portage County, found the sand at 4,873-84 ft. Natural gage was reported as 130 M.c.f.d. and after fracture, 221 M.c.f.d. with a rock pressure of 1,440 psi.

Mississippi wildcat flows oil from Washita-Fredericksburg

A Washita-Fredericksburg oil discovery is reported in Jones County, Mississippi. The well is Triad Oil & Gas Co. et al. 1 E. S. Gambrell in 34-10n-14w.

The well flowed 450 bbl. of 17.5°-gravity oil per day from perforations at 9,472-76 ft. The gage was based on a drill-stem test run using ⅜-in. top choke. Operators will complete one zone only, though production was indicated earlier in the Paluxy at 11,512-24 ft.

Devonian production tapped at New Mexico wildcat test

A wildcat in northeastern Lea County, 15 miles south of Bronco in Southeast New Mexico, flowed 456 bbl. of oil per day through 12/64-in. choke to open a new Devonian field.

This new discovery is Sinclair Oil & Gas Co. 1 C. S. Stone in 22-15s-38e, 4½ miles southeast of Denton field. The well flowed from perforations at 12,740-52 ft., natural.

New discovery reported in Holmes County, Ohio

A wildcat discovery with indications of a new pool opener was hit by Ohio Fuel Gas Co. in Salt Creek Township, Holmes County.

This first producer in the township, 1 David S. Miller, Section 10, found the Clinton sand at 3,797-3,821 ft. Natural gage was reported as 618 M.c.f.d. and after fracture, 6,700 M.c.f.d. with an 18-hour rock pressure of 1,240 psi.

Reeves County, West Texas has Cherry Canyon discovery

A workover well in Ford-Delaware field, Reeves County, West Texas, pumped 21 bbl. of oil plus 94% water per day from perforations at 3,968-4,074 ft. in Cherry Canyon.

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The well is Continental Oil Co. 24 G. E. Ramsey Jr. 19, 11 miles northwest of Orla in Section 24, Block 58, T-1, T&P Survey.

King County. Ard Drilling Co. completed a Bend conglomerate gas-condensate discovery in northeastern King County, 12 miles west of Truscott in Section 51, BS&F Survey. The well is 1-A R. B. Masterson. It flowed 2,100 M.c.f.d. plus 91 bbl. of condensate from perforations at 5,814-20 ft. It is 2 miles north of Juniper field.

Remote South Texas wildcat may open new county

A new producing county for Texas looms at a wildcat in Real County, 25 miles northwest of Leakey. The well is Tucker Drilling Co. 1 Eva Fryar in Section 32, Block "O," T&NO Survey.

A drill-stem test at 5,285-5,335 ft. got gas to the surface in 3 minutes. Flow was 75 M.c.f.d. Recovery was 1,346 ft. of mud, heavily cut with oil and gas plus 400 ft. of gas-cut mud. A test is now being made at 5,318-38 ft. There is no production in Real County. The well is on the Edwards Plateau, one of Texas' most remotely situated and most productionless areas.

Success continues on south flank of N. E. Thompsonville

Northeast Thompsonville field in Jim Hogg County, Southwest Texas, continues to expand its south flank. A stepout discovery was reported at George H. Coates 4 Adolfo Trevino, 18 miles southwest of Hebbronville on the J. T. Sedgerly Survey 580, A-283, and the Almond Fuller Survey 577, A-109, ¾ mile from production on the south edge of the field.

The 9,500-ft. Wilcox completion was from perforations at 9,770-81 ft. Total depth is 9,831 ft. with production through 2⅜-in. tubing at 9,726 ft. Flow was up to 5,841 M.c.f.d. through 7/32-in. choke. Condensate output was 2 bbl. per million cubic feet of gas.

Workover in Texas Gulf Coast field opens gas production

An old well in Quinn field, Liberty County, Texas Gulf Coast, was worked over into a good gas producer. It is Sohio Petroleum Co. 1 B. E. Quinn, Jr. Originally it was completed 10 years ago as a gas-condensate well at 7,170-75 ft.

New flow was 7,200 M.c.f.d. from Cockfield "G" sand perforations at 6,989-99 ft. Gas-liquid ratio is 47,600:1. Location is 8 miles south of Cleveland in the James Humphrey's Survey, A-212. There is no production from this zone in the area. Closest wells are 2,375 ft. northwest, 3,070 ft. southwest and 1,360 ft. south from Cockfield reservoirs at 6,174-7,350 ft. in Quinn field.

Southwest Texas. Crow Drilling & Producing Co. 1 W. A. Smith is a new Slick Wilcox gas discovery in Live Oak County.

The well flowed 3,300 M.c.f.d. plus condensate at the rate of 17 bbl. to the million. Flow was from perforations at 7,527-36 ft. Location is in the Cameron CSL Survey, A-145. It lies between Wilcox production at Braslau and Harris fields. Name requested for the new area is South Harris.

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July footage account

	Field wells					Wildcats			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	11,509	.....	.....	.....	.....	.....	.....	.....	.....
Alaska	32,315	.....	.....	.....	.....	.....	.....	.....	.....
Arizona	.....	.....	.....	.....	.....	.....	.....	.....	6,515
Arkansas	41,470	.....	7,337	66,161	1,637	.....	.....	.....	24,103
California	320,223	.....	19,154	88,551	6,200	.....	.....	6,000	139,318
Colorado	23,008	.....	30,484	83,055	.....	.....	.....	5,730	111,752
Illinois	174,606	.....	829	152,886	120,432	21,915	.....	.....	87,690
Indiana	22,234	.....	.....	39,186	3,842	3,592	.....	.....	17,752
Kansas	293,889	.....	77,191	203,826	33,773	35,526	.....	12,657	207,724
Kentucky	35,471	.....	35,216	62,844	242,658	3,510	.....	.....	7,562
Louisiana	763,536	107,071	205,379	373,199	.....	23,607	.....	.....	332,407
North	182,189	41,509	90,306	111,852	.....	9,222	.....	.....	61,060
South	418,394	65,562	91,474	208,839	.....	14,385	.....	.....	242,958
Offshore	162,953	.....	23,599	52,508	.....	.....	.....	.....	28,389
Michigan	58,963	.....	22,730	54,468	4,547	.....	.....	5,350	61,281
Mississippi	105,629	15,721	11,226	99,164	5,610	7,169	.....	.....	141,054
Missouri	.....	.....	.....	.....	.....	.....	.....	.....	8,212
Montana	94,103	.....	.....	6,283	.....	.....	.....	.....	63,681
Nebraska	111,107	.....	5,200	55,978	.....	26,215	.....	.....	222,027
Nevada	.....	.....	.....	.....	.....	.....	.....	.....	4,750
New Mexico	290,321	.....	269,221	67,758	.....	22,380	.....	25,568	114,408
West	49,261	.....	259,841	19,951	.....	.....	.....	.....	12,047
East	241,060	.....	9,380	47,807	.....	22,380	.....	25,568	102,361
New York	100,875	.....	5,963	2,650	48,325	.....	.....	.....	14,564
North Dakota	86,464	.....	.....	36,082	.....	.....	.....	.....	49,723
Ohio	85,869	.....	42,385	33,833	6,655	.....	.....	.....	17,752
Oklahoma	640,479	74,955	102,227	197,556	43,438	7,444	.....	34,068	71,655
Pennsylvania	39,672	.....	84,892	16,154	20,011	.....	.....	10,038	47,224
Texas	2,485,877	279,339	603,527	813,564	46,711	200,303	55,768	143,227	1,143,014
District 1	66,603	.....	22,180	12,625	.....	1,518	.....	15,418	68,810
District 2	188,300	25,048	85,050	67,461	.....	.....	21,895	68,947	153,446
District 3	333,964	156,994	37,511	172,172	.....	31,529	20,417	.....	160,885
District 4	100,755	11,315	116,994	109,198	.....	.....	.....	27,774	209,650
East	254,345	23,935	52,154	92,703	.....	14,348	13,456	3,300	128,384
District 7-B	131,798	10,648	42,320	60,769	.....	11,360	.....	10,396	72,986
West	838,733	11,230	159,865	135,044	2,546	116,506	.....	7,292	228,724
District 9	398,767	11,646	.....	112,574	44,165	25,042	.....	.....	77,003
District 10	172,612	28,523	87,453	51,018	.....	.....	.....	10,100	43,126
Utah	27,101	.....	12,169	11,114	.....	9,523	.....	15,021	47,431
Virginia	.....	.....	8,004	.....	.....	.....	.....	.....	.....
West Virginia	16,177	.....	139,635	19,733	.....	.....	.....	.....	6,136
Wyoming	133,941	.....	27,375	62,213	9,320	20,726	.....	.....	159,803
Total U. S.	5,994,839	477,086	1,710,144	2,546,258	593,159	381,910	55,768	257,659	3,107,538

Swastika production found at West Central Texas wildcat

New Swastika sand oil production is reported in southeastern Cole County, West Central Texas. The discovery well is Western Petroleum Co. 1 H. G. Wendland estate.

Flow was 420 bbl. of oil per day on 18/64-in. choke from perforations at 3,632-41 ft. Name suggested for the new field is Pauson Swastika sand. Location is in the Frederick Merkel Survey 445, 12 miles southeast of Robert Lee, Tex., and ¼ mile southeast of Winkirk Cisco Pennsylvanian field.

Dual discovery seen for Denton County, North Texas

A dual discovery is in the mill for Denton County at Carter - Gifford Oil Co. et al. 1 M. A. Knox, a 9,000-ft. wildcat 4 miles north of Justin in the southwestern part of the county.

The well reportedly found production on tests at 5,182½ ft. in the Davis and in the Cordell sands at 5,757-5,967 ft. No details have been released as yet. Location is in the A. C. Madden Survey, A-852. There is no nearby production.

Wolfcamp Permian discovery completed in Texas

New Wolfcamp production was opened in Glasscock County, West Texas. Discovery well is Texas National Petroleum Co. 1 Edmund Tom, a 10,200-ft. wildcat in the northwestern part of the county, 5 miles southeast of Stanton.

The well flowed 260 bbl. of 45°-gravity oil per day on 7/64-in. choke from perforations at 9,690-99 ft. Location is in Section 44, Block 35, T-1-S, T&P Survey, 4 miles south of Gordon Street field of southeastern Martin County, Texas.

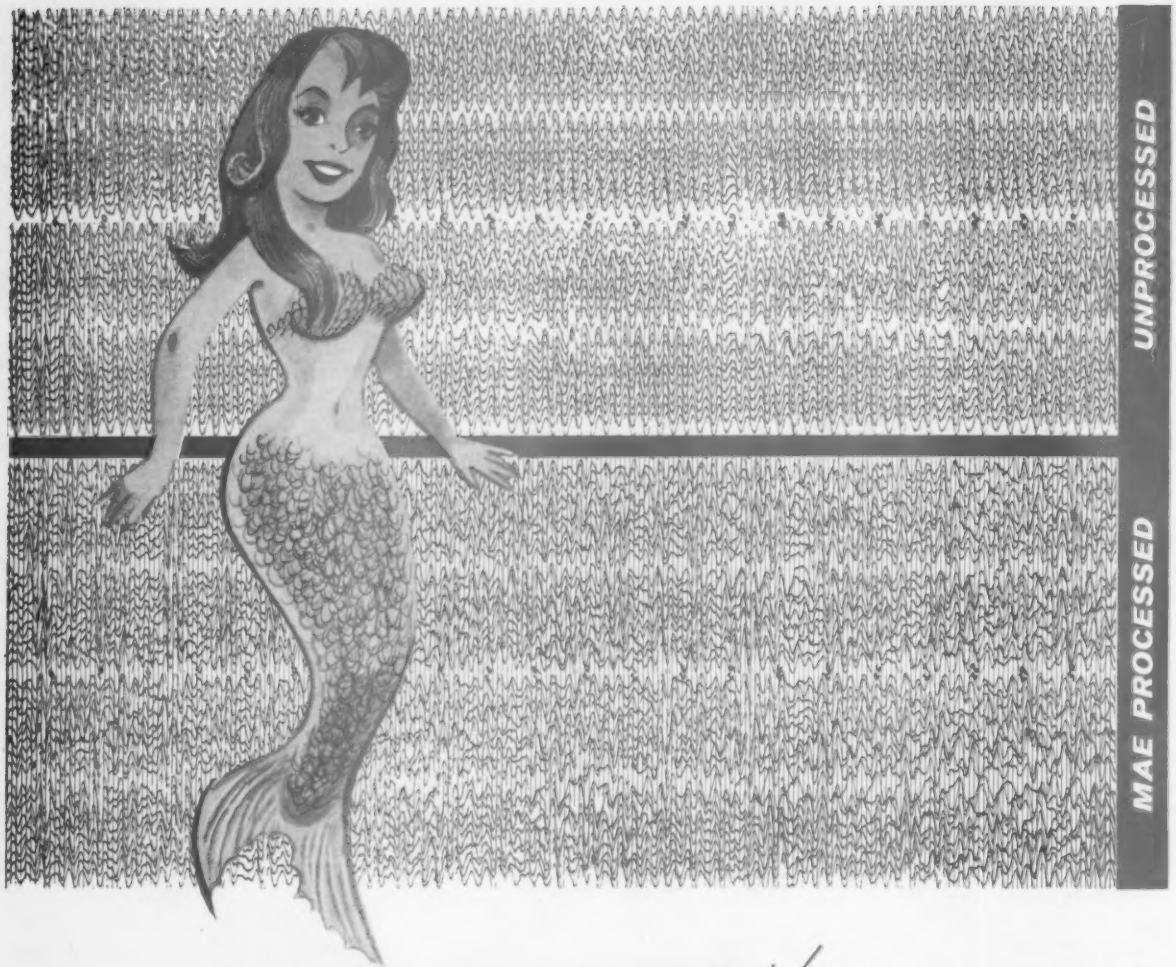
Morrow sand flows gas at Panhandle wildcat

Ochiltree County has a new Morrow Pennsylvanian sand gas pool at Shamrock Oil & Gas Corp. 1-B Helen D. Nabers.

The well flowed 5,500 M.c.f.d. from perforations at 9,713-30 ft. Location is 20 miles southeast of Perryton and 5 mile southeast of Dutcher field. Spot is in Section 383, Block 43, H&TC Survey.

New gas reserve tapped in Oklahoma's Marietta basin

The Marietta basin in extreme southern Oklahoma has a new Springer Pennsylvanian producing area. Discovery well is Humble Oil & Refining Co. 1 Resources unit



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in NE SW SW 14-6s-2e, 5 miles southeast of Overbrook and 3 miles northwest of big West Enville gas field.

A drill-stem test at 7,038-95 ft. had gas to the surface in 4 minutes. Well flowed 8 M.M.c.f.d. Test is slated for 12,000 ft.

Louisiana's North Thibodeaux moves 2 miles west

Trice Production Co. has extended North Thibodeaux field, La-Fourche Parish, Louisiana, 2 miles to the west with a gas-distillate discovery.

On a 24-hour test, Trice's 1 Legarde potentialed 2,700 M.c.f. of gas and 24 bbl. of 50°-gravity oil on a 12/64-in. choke. Flowing pressure was 3,750 psi. and shut-in pressure was 3,940 psi.

The well was drilled to 12,010 ft. Casing was run to 11,000 ft., and the well was perforated in the interval 10,784-90 ft. in Miocene sand.

The nearest production is in North Thibodeaux field where Trice has one producer.

New color map for Washington published

A new geologic map of Washington has been published by the State Department of Conservation.

This colored map is a revision of the earlier preliminary geologic map of the state that went out of print in 1956 as a result of the heavy demand during the uranium-prospecting rush.

The new map is the result of recent mapping by geologists of the State Division of Mines and Geology, in cooperation with the USGS, plus a very painstaking compilation of information from all available maps showing geology in Washington. The source maps were acquired from government agencies, private companies, candidates for advanced college degrees, and independent geologists.

The scale of the map is 1:500,000, or about 1 in. equals 8 miles. The more than 100 different rock types shown on the map are explained in a legend. The map shows that all of the major rock types and most of the uncommon ones known to geologists may be found in the state.

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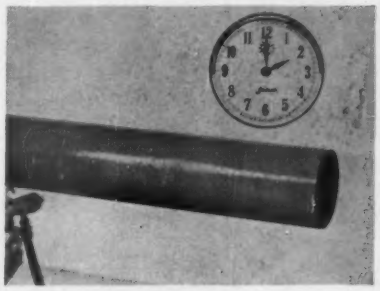

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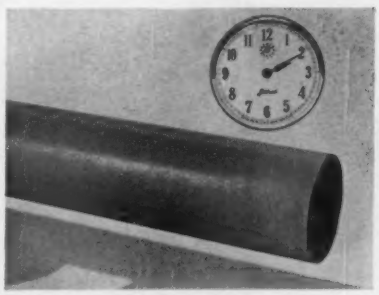

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JULY MULTIPLE COMPLETIONS

	Dual	Triple	Quad.	Total new reservoirs—Oil	Gas	Total
Colorado	1	..	..	..	2	2
Kansas	4	..	..	7	1	8
Louisiana	14	4	..	20	20	40
North	7	1	..	8	9	17
South	5	..	..	8	2	10
Offshore	2	3	..	4	9	13
Mississippi	1	..	..	..	2	2
Nebraska	3	..	..	6	..	6
New Mexico	4	1	..	5	6	11
Oklahoma	29	1	1	45	20	65
Texas	47	8	..	75	43	118
Dist. 1	6	..	..	6	6	12
Dist. 2	9	..	..	12	6	18
Dist. 3	9	1	..	8	13	21
Dist. 4	6	4	..	9	15	24
East	5	..	..	8	2	10
Dist. 9	6	1	..	15	..	15
West	6	2	..	17	1	18
Wyoming	2	..	..	2	2	4
Total	105	14	1	160	96	256

These rocks range in age from Precambrian to Recent sediments that are being deposited in present-day streams.

A list of source material shows that about 150 sources were used in compiling the map, and a colored index map shows the areas covered by each source. A list indicates that more than 300 geologic formations shown on the source maps were combined into the 104 units shown on the new map.

The map may be purchased for $3, prepaid, from the Department of Conservation, 335 General Administration Building, Olympia, Wash. The map, on a sheet 51 by 76 in., may be obtained either folded in an envelope or rolled in a tube.

Pennsylvania adds two new petroleum laws

On July 25, the Honorable David L. Lawrence, governor of Pennsylvania, signed into law two bills to conserve and enable the orderly development of oil and gas deposits. In signing them, Governor Lawrence called them "a major step forward in Pennsylvania's industrial-development program."

Under these laws, an Oil and Gas Commission will be established in the State Department of Mines and Mineral Industries, with authority to order the spacing of wells on application of any owner of oil and gas rights in the territory concerned.

The new laws are a victory for Secretary of Internal Affairs Genevieve Blatt, who is Pennsylvania's representative on the Interstate Oil Compact Commission. This state joined the compact in 1941, but it has taken all this time to implement the membership with proper laws.

Miss Blatt has advocated the legislation in the last three legislative sessions. The laws finally adopted were the result of planning by industry and governmental agencies, in which differences of opinion were ironed out.

On July 29 the torch was put to Pennsylvania's first in situ-combustion experiment. It is being conducted on the property of the Quaker State Oil Refining Corp. near Goodwill Hill, Pa. Technical assistance is being supplied by men from the United States Bureau of Mines, Appalachian Experiment Station, Morgantown, W. Va. The natural-gas flame at the bottom of the intake well will be kept burning and the hot gases forced into the producing horizon until the oil in the producing horizon is ignited. The burning oil and gas front will then be forced towards the producing well.

It is hoped that a second such experiment will be started soon in the Franklin area in Venango County.

One shallow well and seven deep wells are being drilled by rotary in the state. Six other rotary rigs are idle.

In Alberta's Wilson Creek

Drillers hit third straight gas find

THE TEAM of Canadian Superior Oil, Ltd., Luscar Coals, Ltd., and Imperial Oil Ltd. has scored its third successive gas discovery in the Wilson Creek district of Central West Alberta, 45 miles northwest of Red Deer.

While this venture is only 2 miles south of a previous gas success, the pay zone appears to be separate from the nearby hole although it was found in the same Mississippian structure. Actually, the previous discovery hole found natural gas in the Pekisko portion of the Mississippian while the new strike was apparently made in the Banff zone. However, company officials stated that further correlation in the area and in the new hole would have to be done before that fact was definitely established.

The strike, 6-18-43-4 Wilson Creek, is on LSD 6, 18-43-4w5. Top of the Mississippian formation was found at 7,067 ft., or 2,878 ft. subsea, and drill-stem test was conducted of the interval 7,129-7,225 ft. During the 3 hours valve was open gas flows ranged from 5.3 M.M.c.f.d. at the outset, increased to 7 M.M.c.f.d. after 65 minutes and then leveled at 6.7 M.M.c.f.d. by end of test.

The well is close to the previous Canadian Superior 10-30 Wilson Creek Pekisko gas strike which flowed at rate near 4 M.M.c.f.d. on drill-stem test. It lies 15 miles west of D3 oil and gas producers in the Homeglen-Rimbey field, 8 miles northeast of Cardium oil successes in the Willesden Green field and 6 miles south of another Pekisko gas success drilled by the same team, 10-13 Wilson Creek.

This group has substantial acreage holdings in the vicinity of the three successful gas wells and recently added two more sections to its total. That land, lying to the southwest and south of the recently discovered gas section, was purchased at an average price per acre between $30.25 and $40.25. The hole itself is on lands contained in Drilling Reservation No. 748 which was purchased by the Canadian Superior-headed group on October 6, 1960. For the 7,840 acres contained in it a bonus of $551,226 was paid to the Alberta government, or an average of $70.31 per acre. As gas was found within the limits of it the entire area may be converted to Natural Gas Licence and Leases earned from it if further drilling is done within its boundaries.

It is expected that production test operations on the new strike will be carried out soon as 7-in. casing was landed near total depth 7,285 ft. and the well capped pending further work.

Good gasser for B. C.

In northeastern British Columbia, Hudson's Bay Oil & Gas Co. made a good gas discovery at B-27-F-94-B-15 Cypress, 100 miles northwest of Fort St. John and 12 miles from production.

The well flowed up to 11,600 M.c.f.d. on a drill-stem test in the Baldonnel formation at about 4,300 ft. Net pay thickness is 113 ft. This discovery is located on a drilling reservation in the company's Sikanni Chief acreage block. The operators continued drilling below 7,660 ft., planning to go to 8,500 ft. The company holds 1,372,000 net acres under lease in northeastern British Columbia. Continental Oil Co. and Hudson's Bay Co. are joint owners of Hudson's Bay Oil & Gas Co.

Glauconitic might pay Alberta drillers

THE GENERAL Rowley - Drumheller district of southern Alberta—about 65 miles northeast of Calgary—has indicated that the Glauconitic sandstone might richly reward exploration. A recent development in the district, unnoticed for some time because of the type of test conducted on it, could prove significant for a currently not-too active region.

British American Oil Co., Ltd., earlier this year drilled a tight hole at Munson which is immediately between Devonian oil production in the Drumheller area and Pekisko oil and gas successes in Rowley field. A wire-line test was made in

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the Glauconitic that gave 79.1 cu. ft. of gas and 1,200 cc. of filtrate water. Following the drilling of the hole through the Devonian to a depth some 3,000 ft. below the top of the Glauconitic, production casing was set and the well capped. Very recently, the well was perforated opposite the potential gas sand and following a small acid treatment flow rates of up to 10,600 M.c.f.d. were measured. From a series of those production tests, an absolute open-flow potential of 33,300 M.c.f.d. was established. The well has once again been shut in pending market outlet.

It was drilled as B. A. McConkey 7-34 Munson, on LSD 7, 34-30-20w4. It is 5½ miles north of oil production in the Drumheller complex of fields, the same approximate distance south-southeast of Pekisko oil production in Rowley field, 2½ miles southeast of the Gulf 4 C. L. Olsen wildcat that was abandoned at a depth of 5,943 ft., and 25 miles south of the larger and more prolific Devonian oil field at Fenn-Big Valley.

Pay. The Glauconitic on this newly indicated commercial discovery was found around the 4,370-ft. level. The wire-line test which found gas was set and opened at 4,429 ft. It is estimated that there is about 50 ft. of gross pay in the sand and with 20 ft. of it opened by perforations it is thought that net pay thickness is near 35 ft.

This particular region of southern Alberta has been explored to a large degree by British American (formerly operating in Canada as Canadian Gulf) and has also paid rich dividends. In fact, Fenn-Big Valley field to the north of the new strike was discovered by Gulf and developed to a major degree by it and BA. The firm also has major interest in West Drumheller field.

Most of the wells drilled in this district by the firm are situated on lands acquired under agreement from the Canadian Pacific Railway. That agreement covered a substantial amount of lands in Alberta and a great deal of them are in this district. Fenn-Big Valley field was developed almost entirely on CPR lands as was the Stettler field a few miles north of it. Likewise, BA's interest in Drumheller field is also on the same type of land holdings.

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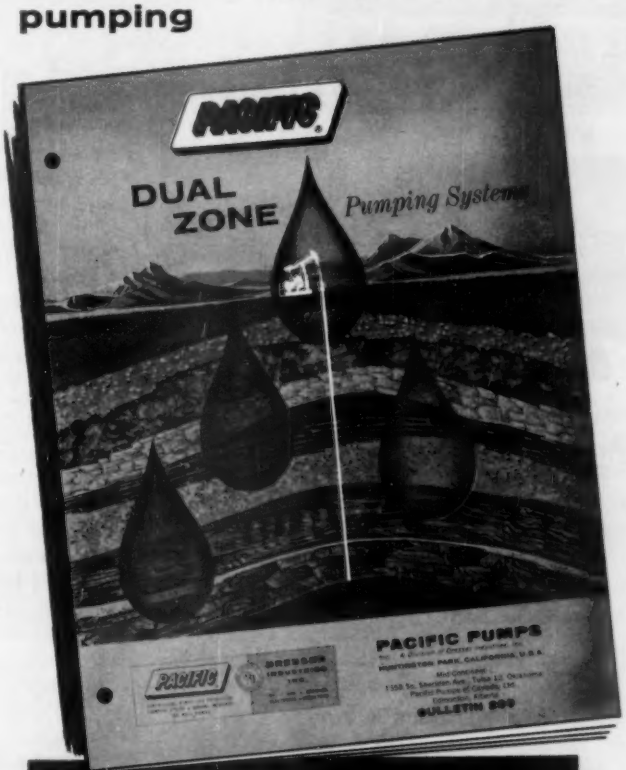

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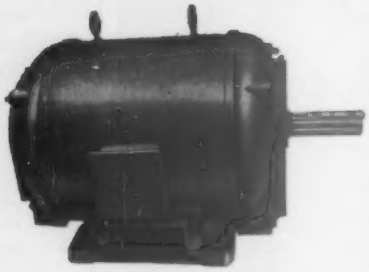

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THE SPARK touched off by Imperial Oil Ltd. when it announced development plans for the Boundary Lake field of British Columbia should be fanned into a white-hot drilling program as other development companies with proved oil rights scramble for their share of the British Columbia oil market.

Until recently many operators have been very skeptical of the announced oil pipeline out of Northeast British Columbia to supply the Vancouver refining area, but with pipe being strung and work advancing on other phases of this Premier Bennett approved project there is every indication that the market for crude will be available to those producers with crude to supply it later this fall.

Imperial, perennial leader of the Canadian oil industry, very recently announced plans involving four rigs in a continuous drilling program that could see upwards of 40 wells drilled before the end of the year. First four locations have been staked and others will follow as the development pattern is set. An Imperial official remarked that its present project will assure it of its proportionate share of pipeline throughput. No other firms have yet announced plans but the 40-odd wells planned by Imperial at Boundary Lake could be between 10 and 20% of the wells required to fully develop British Columbia's presently proved reserves.

Although development of the west coast province's gas reserves and deliverability has been relatively rapid, oil development has been stunted by lack of market. This will change quickly now. In addition to development projects by other firms at Boundary Lake, the province's remaining proved oil areas such as Milligan Creek, Beatton River, Peejay, and Blueberry will see a rush of development.

Pipeline tariffs for the crude-oil lines that will transport the production from these fields to the Kamloops area and eventually to Vancouver have not been announced and will be largely dependent on throughput. It is estimated that about 25,000 bbl. per day throughput will be required initially. At present, without further discoveries the 25,000 bbl. is near the estimated actual potential of British Columbia. It is to be hoped that net return to the producing company will be sufficient to foster additional exploration for more reserves and thus keep the wheels of industry rolling. Failure to realize this basic fact could turn it from boom to bust in all too short a period.

Downdip Wilcox wildcat slated for South Texas

In South Texas Michel T. Halbouty has staked location and is moving in equipment for the drilling of a significant wildcat in the downdip Wilcox trend of northeastern Zapata County.

The Halbouty 1-B Lauro Garza is located in the J. M. Montemayor Survey No. 416, abstract 398. Permitted to 11,500 ft., this test is located on a 5,000-acre block immediately east of shallow production in the Escobas field.

This wildcat will be of particular significance since it is located in a portion of the trend which has had no Wilcox exploration to date.

Discovery wells

KANSAS

Saline County:

Mutual Oil Co. and Tom Brown 1 E. F. Collins, S½ NW SW 25-15s-3w. IPP 15 BO and 15 BWPD, 37°, Maquoketa dolomite open hole 3,290-96 ft. TD 3,296 ft. New oil discovery in Salina basin.

SOUTH LOUISIANA

Terrebonne Parish:

The California Co. 1 LL&E 29, 9-24s-17e. IPF 126 BOPD, 1% b.s. and w. plus 132 M.c.f.d., 7/64-in. choke, TP 2,250 psi., 24°, GOR 1,048:1, 14,076-96 ft. TD 14,385 ft. New oil discovery.

Republic Natural Gas Co.-Commonwealth Oil Co. A-1 South Coast, 59-18s-18e. IPF 2,225 M.c.f.d., 9/64-in. choke, TP 4,550 psi., 11,518-22 ft. TD 15,023 ft. PB 12,060 ft. New gas discovery.

MICHIGAN

St. Clair County:

McClure Oil Co. and I. W. Hartman 1 Gill, SE NE SE 29-4n-15e, ¾ mile north Boyd pool. AIP 60 BOPD. Elev. 636, A-1 Salina 2550, Brown Niagara 2,646, TD 2,651, perfs. 2,656-59 ft. Oil field extension.

NEBRASKA

Banner County:

Ambassador Oil Corp. 1 Trenerry, C SW SW 11-17n-55w. IPP 223 BO, 70 BWPD and 557 M.c.f.d., GOR 250:1, "J" sand 6,205-9 ft. TD 6,291 ft. "J" sand discovery, new field.

Stuarco Oil Co. et al. 1 Olsen, C SE NW 10-19n-55w. IPF 420 BOPD, open tubing, 38.5°, "D" sand 5,306-7 ft. TD 5,519 ft. "D" sand discovery, new field.

Cheyenne County:

Texota Oil Co. 1 Madden, NW NE 24-13n-53w. IPP 60 BO, 40 BW in 11 hours, "D" sand 5,524-26 ft. TD 5,700 ft. "D" sand discovery, new field.

Down & McHugh et al. 1 Clow, C SE SW 5-14n-50w. IPP 86 BOPD, plus 42% water, "D" sand 4,803-8 ft. TD 5,034 ft. "D" sand discovery, new field.

Red Willow County:

Simmons Oil Co. et al. 1 Fischer, C NE NW 25-2n-27w. IPP 126 BOPD, cut 20% water, Lansing-Kansas City 3,363-72 ft. TD 3,671 ft. Lansing-Kansas City discovery, new field.

NEW MEXICO

Eddy County:

Gulf Oil Corp. 4 Seven Rivers Hills unit 11 miles northwest of Carlsbad in 4-21s-25e. IPCAOF 1,305 M.c.f.d., Morrow 10,096 ft. TD 10,784 ft. New gas discovery.

Lea County:

El Paso Natural Gas Co. 1 Mescalero unit, 15 miles southeast of Maljamar in 7-19s-34e. IPF 7,200 M.c.f.d., 12/64-in. choke, Pennsylvanian 13,160-13,212 ft. New gas discovery.

Wm. A. and Edward R. Hudson 1 Signal Ross-Federal, 1½ miles southeast of Yates production in 30-19s-33e. IPF 840 BOPD, 1-in. choke, TP 20 psi., CP 20 psi., Yates 3,000-21 ft. TD 3,192 ft. New oil discovery.

NORTH DAKOTA

Burke County:

Monsanto 1 Swenson, C SW SW 10-160n-91w. IPP 90 BOPD, plus 43% water, Mission Canyon 7,114-21 ft. TD 7,425 ft. Mission Canyon discovery, new field.

OHIO

Holmes County:

Ohio Fuel Gas Co. 1 David S. Miller, Sec. 10, Salt Creek Twp. IPOF 6,700 M.c.f.d., IRP 1,240 psi., Clinton 3,797-3,821 ft. TD 3,829 ft. New gas discovery.

OKLAHOMA

Comanche County:

Woods Exploration and Peake Petroleum Co. 1 Meade, 3 miles northeast of Fort Sill field in C SW SE 6-3n-9w. IPF 5,300 M.c.f.d., with tract condensate, 36/64-in. choke, FTP 680 psi., Rowe sand 5,825-78 ft. TD 8,590 ft. PBTD 5,902 ft. New gas discovery.

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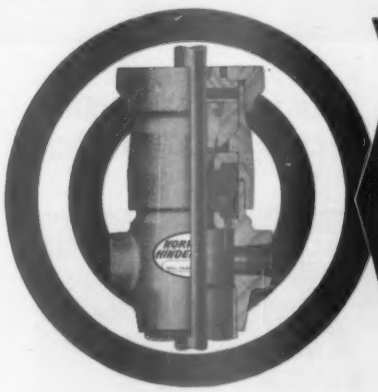

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WRITE FOR NEW WELL HEAD BULLETIN
P. O. BOX 1739, TULSA

TUBING on CASING HEADS

Creek County:
Sunray Mid-Continent Oil Co. 1 Sim Lamons, SE NW NW 23-14n-9e, 1 mile west of West Donnelly field. IPF 72 BO/23 hours, 32/64-in. choke, 32°, Dutcher 3,028-58 ft. TD 3,714 ft. New oil discovery.

Garfield County:
Geological wildcat in Northeast Antelope field. Apache Corp. 1 Harman, C NE SE 36-23n-3w. IPP 46 BOPD and 60 BSWPD, Miss. Chat 4,766-80 ft. TD 4,850 ft. New zone discovery.

Pittsburg County:
Geological wildcat at Carney field. Apache Oil Corp. 1 Etchison unit, NW SE NW 4-7n-18e. IPCOF 4,707 M.c.f.d., Basal Atoka sand 6,184-6,212 ft. TD 6,902 ft. New gas discovery.

NORTH TEXAS

Hardeman County, Medicine Mounds Mississippian field:
J. C. Maxwell 1 Joe D. McClellan II, 4 miles south of Chillicothe in R. Walker Sur., A-1290. IPF 217 BOPD, 10/64-in. choke plus 3% water, 44.2°, GOR 125:1, TP 600 psi., CP 675 psi. Mississippi open hole 8,200 ft. TD 8,357 ft. New oil discovery.

Knox County:
H. S. Rose et al. 7 Joe Maloney, 3 miles south of Goree in Sec. 216, R. Wilkins Sur., A-411. IPF 62 BOPD, 12/64-in. choke, 36°, GOR 250:1, TP 120 psi., CP 575 psi., Tannehill 692-96 ft. TD 1,780 ft. New oil discovery.

Wise County:
William L. Rodgers 1 Mrs. Ione Buckner McAlister, 3½ miles north of Bridgeport in BBB&C Sur., A-114. IPF 144 BOPD, 12/64-in. choke, TP packer, CP 560 psi., 41°, GOR 960:1, Penn conglomerate 5,224-33 ft.; IPF 133 BOPD, 12/64-in. choke, TP 640 psi., packer, 43°, GOR 1,160:1, Penn conglomerate 5,639-48 ft. TD 5,705 ft. Dual oil discovery.

WEST TEXAS

Andrews County:
Ralph Lowe 1-W Southland Royalty "B," 5 miles southwest of Andrews in Sec. 21, Blk. A-46, PSL. IPF 216 BOPD, 10/64-in. choke, 39.5°, GOR 1,200:1, TP 200 psi., packer, Wolfcamp Permian 8,510-84 ft. TD 9,355 ft. New oil discovery. Wolfcamp find in Deep Rock field.

Concho County:
Sunray Mid-Continent Oil Co. 1 J. E. Henderson, 8 miles southwest of Eden in Sec. 55, Blk. 8, H&TC Sur. IPP 85 BOPD, 37.7°, GOR 177:1, Hope lime 2,393-2,401 ft. TD 4,320 ft. New oil discovery.

Crane County:
Limpia Royalties Inc. 1 J. B. Tubb, 15 miles west of Crane in Sec. 21, BLK. B-27, PSL Sur., IPF 97 BOPD, 16/64-in. choke, 37.5°, GOR 372:1, TP 180 psi., CP packer, Ellenburger 5,739-56 ft. TD 5,765 ft. New oil discovery.

Crockett County:
B. M. Hanson 1 Helen S. Carpenter, 9 miles northwest of Iraan in Chas. L. Stisser Sur., 1950. IPP 10 BOPD, 27°, Grayburg 1,168-74 ft. TD 1,200 ft. New oil discovery.

SOUTH TEXAS

DeWitt County:
Argo Oil Corp. 1 Beulah McDougal et al., 3 miles southeast of Cuero in Hepzebeth Taylor Sur. A-43. IP shut in gas well. Wilcox 11,424-28 ft. TD 12,525 ft. Shut-in gas discovery.

Karnes County:
Skinner Corp. and L. B. Horn 1 Schorre, 5 miles south of Runge in Lot 21, Auld and Carter Subd. of Carlos Martinez Grant, A-6. IPAOF 8,400 M.c.f.d., SITP 501 psi., 50°, GLR 13,300:1, BHPSI 2,896 psi., Massive Wilcox 6,690-94 ft.; IPAOF 4,300 M.c.f.d., SICP 2,319 psi., 50.2°, GLR 180,800:1, BHPSI 2,787 psi., Luling Wilcox 6,558-65 ft. TD 6,805 ft. Dual gas-condensate discovery.

McMullen County:
W. Earl Rowe 1 G. A. Lowrance, 17 miles southeast of Tilden in Sec. 26, S. N. Steinhardt Sur. A-728. IPAOF 7,650 M.c.f.d., SITP 918 psi., BHPSI 965 psi., dry gas, Argo 2,300-ft. sand, 2,324-29 ft.; 7,300 M.c.f.d., SICP 586 psi. BHPSI 608 psi., dry gas, Second Cole 1,800-ft. sand, 1,818-24 ft. TD 2,981 ft. Dual gas discovery.

Refugio County:
Kirkwood Drilling Co. 1-B Jamie Hynes, 4 miles north of Refugio in John Malone Sur., A-46. IPAOF 2,500 M.c.f.d., SITP 2,271 psi., 67.8°, GLR 93,500:1, BHPSI 2,691 psi., 6,670-ft. Frio sand 6,667-72 ft. TD 7,330 ft. New gas-condensate discovery.

San Patricio County:
Selby-Walker Corp. 1 Lyra M. Sparks et al., 2 miles west of Sinton in John Pollan Sur., A-23. IPAOF 42 M.M.c.f.d., SICP 765 psi., BHPSI 806 psi., dry gas, 2,300-ft. Miocene sand 2,328½-2,329½ ft. TD 3,642 ft. New gas discovery.

SOUTHWEST TEXAS

Nueces County:
East Robstown. Logue & Patterson et al. 1 City of Robstown, Geo. H. Paull Subd. "D," Driscoll Ranch. IPAOF 1,360 M.c.f.d., SITP 661 psi., BHPSI 744 psi., dry gas, 5,300-ft. sand, 5,305-11 ft.; IPAOF 2,400 M.c.f.d., SICP 828

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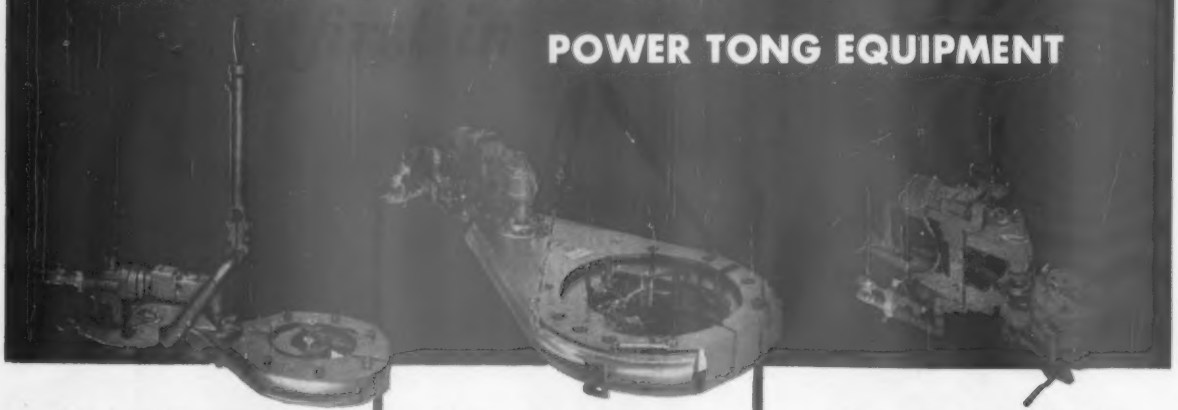

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psi., BHPSI 964 psi., 65°, 97,600:1, 5,875-ft. sand 5,872-78 ft. TD 6,315 ft. Dual gas discovery, both new pays.

TEXAS GULF COAST

Colorado County:

Matthews field. Brazos Oil & Gas Co. 1 Matthews Brothers, 4½ miles northeast of Garwood in James Nelson Sur., A-35. IPAOF 2,320 M.c.f.d., SITP 4,135 psi., BHSIP 5,140 psi., GLR 54,000:1, 47.9°, Wilcox 9,620-30, 9,658-88, and 9,698-9,714 ft. TD 12,005 ft. New gas-condensate discovery.

Jasper County:

Atlantic Refining Co. 1 M. Flores Fee "B," 6⅓ miles north of Northeast Buna in M. Flores Sur., A-13. IPF 216 BOPD, 16/64-in. choke, TP 325 psi., GOR 940:1, 42.4°, 9,650-ft. Wilcox 9,650-57 and 9,656-63 ft. TD 11,400 ft. New oil discovery.

Jefferson County, offshore:

Block 160-Federal High Island, Don area. Shell Oil Co. 1 Federal Blk. 160, OCS-0743. 28 miles southeast of High Island. IPF 43,500 M.c.f.d., SITP 3,380 psi., BHSIP 4,000 psi., GLR 274,800:1, 47.4°, 8,400-ft. Miocene 8,464-69 and 8,444-49 ft. TD 8,469 ft. New gas-condensate discovery offshore from Texas.

Matagorda County:

North Buttermilk. Sinclair et al. 1 John T. Jones, 9 miles south of Francitas in Rynd Lawder Sur., A350. IPAOF 1,600 M.c.f.d., SITP 6,594 psi., BHSIP 8,532 psi., GLR 46,170:1, 47.8°, 12,500-ft. Discorbis 12,540-52, 12,561-69, 12,574-87, and 12,591-96 ft. TD 14,000 ft. New gas-condensate discovery.

WEST CENTRAL TEXAS

Callahan County:

E. J. McCurdy, Jr., 1 Hancock, 1½ miles southwest of Baird in Sec. 78, BBB&C Sur. IPF 235 BOPD, 30/64-in. choke, 45.5°, GOR 1,172:1, TP 125 psi., CP 1,000 psi., Ellenburger 4,546-64 ft. TD 4,604 ft. New oil discovery.

Coleman County:

Wesco Production Co. et al. 1 I. B. Farmer, 2 miles southeast of Novice in Sec. 40, HT&BRR Sur. IPP 42 BOPD, plus 50% water, 2⅜-in. tubing at 3,450 ft., 42°, Gardner sand 3,455-69 ft. TD 3,617 ft. New oil discovery.

Jones County:

T. S. Bridges 1 J. A. Patterson, 1 mile northwest of Stith in Subd. 77, DeWitt CSL 125. IPP 58 BOPD, 43°, GOR 480:1, Flippen lime 2,869-69½ ft. TD 3,120 ft. PB 2,965 ft. New oil discovery.

Shackelford County:

Arnold & Olga Barrett 1 Roy C. McCoy, 2 miles south of Sedwick in Sec. 17, Univ. Lands Sur. IPP 16 BOPD, 2-in. at 595 ft., 37°, 594-99 ft. TD 620 ft. New oil discovery.

Stonewall County:

Cities Service Petroleum Co. 1 Swenson 166, 10 miles northeast of Hamlin in Sec. 166, BBB&C Sur. IPF 110 BOPD, 16/64-in. choke, 39.9°, GOR 120:1, TP 80 psi., CP 20 psi., Cisco sand 3,804-22 ft. TD 4,161 ft. New oil discovery.

Taylor County: J. R. Elliott et al. 1 H. A. Arrant, 5 miles northeast of Tuscola in Sec. 6, Blk. 1, SPRR Sur. IPF 120 BOPD, 16/64-in. choke, 40°, GOR 250:1, packer, TP 150 psi., Dothan sand 1,963-73 ft. TD 2,487 ft. New oil discovery.

WEST TEXAS

Ector County:

Cities Service Petroleum Co. 1-E Edwards, 12 miles southwest of Odessa in Sec. 22, Blk. 44, T-3-S, T&P Sur. IPF 119 BOPD, 20/64-in. choke, 34.3°, GOR 243:1, TP 100 psi., CP 500 psi., Grayburg sand 4,062-4,132 ft. TD 4,271 ft. New oil discovery.

Edwards County:

10.120 ft. New gas-condensate dis-3, TD 6,220 ft. New gas discovery.

cox 5,071-75 ft. TD 5.654 ft. IPF 54°, GLR 8,620:1, MHPSI 5,268 ft. psi., 59.3°, GLR 20,00:1, BHPSI 4,128

Hockley County:

J. C. Williamson 1 Kelsey Smyer, 4 miles southwest of Levelland in Lab. 20, Lge. 30, Baylor CSL Sur. IPP 22 BOPD, plus 4% water, 27°, 7,480-7,517 ft. TD 8,016 ft. Deep oil discovery in Levelland field.

Williamson Petroleum Co. 1 A. L. Hamilton, 6 miles south of Levelland in Atascosa CSL Sur. IPP 165 BOPD, 28°, Clearfork 7,212-7,378 ft. TD 7,425 ft. New oil discovery.

Texaco Inc. 1 H. W. Bailey, 3 miles south of Levelland in Lab. 16, Lge. 29, Atascosa CSL Sur. IPP 123 BOPD, plus 5% water, 30.4°, 7,488-7,603 ft. TD 7,414 ft. New oil discovery.

Kent County:

Sun Oil Co. 1 Mary B. Wallace, McLaury field. IPF 163 BOPD, 24/64-in. choke, 39.8°, GOR 435:1, TP 70 psi., CP packer, Strawn lime open hole 6,507 ft. TD 6,530 ft. IPP 94 BOPD plus 4% water, 34.5°, GOR 83:1, Strawn sand 6,482-92 ft. TD 6,530 ft. Dual oil discovery.

Lynn County:

L. E. Windham 1 Nan T. Guinn, 4 miles east of Wilson in Sec. 3, Blk. L, IRR Sur. IPP 112 BOPD plus 17% water, 37.8°, GOR 268:1, San Andres 4,031-34 ft. TD 4,700 ft. New oil discovery.

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Nolan County:

Lone Star Producing Co. 1 H. H. Johnson, 12 miles southeast of Sweetwater in Sec. 67, Blk. X, T&P Sur. IPF 82 BOPD, plus 79 BW and 80 M.c.f.d., 40.2°, GOR 978:1, TP 100 psi., Canyon Reef 5,820-23 ft. TD 6,780 ft. New oil discovery.

Pecos County:

El Cinco Production Co., Ltd., and Jake L. Hamon 1 Mary Price, 8 miles southwest of McCamey in Sec. 10, Blk. 12, H&GN Sur. IPF 136 BOPD, 16/64-in. choke, 40.2°, GOR 800:1, TP 500 psi., packer. Detrital 5,248-49 ft. TD 5,396 ft. New oil discovery.

Brown & Thorpe Oil Co. 1 J. O. Griffith, 3 miles northwest of Girvin in Sec. 10, Blk. 11, H&GN Sur. IPF 83 BOPD, 16/64-in. choke, 36.4°, GOR 210:1, TP 50 psi., packer, Clearfork 3,078-3,180 ft. TD 3,180 ft. New oil discovery.

Atlantic Refining Co. 1 J. C. Kelly, 31 miles west of Stockton in Sec. 8, Blk. 51, T-10, T&P Sur. IPCAOF 52,500 M.c.f.d., Devonian, Fusselman, Montoya 15,831-16,680 ft. TD 19,696 ft. Deepest production in Texas.

Reeves County:

Leblond & Healey 1 Anthony & Tubb, 13 miles southeast of Barstow in Sec. 6, Blk. C-4, PSL Sur. IPF 133 BOPD plus 43% water, 14/64-in. choke, 39.7°, GOR 1,663:1, TP 650 psi., CP 1,425 psi., Delaware 5,052-56 ft. TD 5,166 ft. New oil discovery.

Runnels County:

Karl Hoblitzelle 1-F Jack B. Herring, 6 miles southeast of Norton in Sec. 34, H&GN Sur. IPF 289 BOPD, 14/64-in. choke, 46°, GOR 260:1, TP 250 psi., packer, Canyon sand 3,275-79 ft. TD 3,401 ft. New oil discovery.

Rankin & Graham and Lario Oil & Gas Co. et al. 1 D. J. Kirkham, 14 miles northwest of Ballinger, Burnett CSL Sur. 271. IPF 144 BOPD, 16/64-in. choke, 42.9°-gravity, GOR 985:1, TP 450 psi., CP 1,050 psi. Jenn sand 4,798 and 4,793 ft. TD 5,005 ft. New oil discovery.

William D. Austin et al. 3 W. F. Bredemeyer, 2 miles west of Winters in CTRR Sur. 75. IPF 157 BOPD, 10/64-in. choke, 44°, GOR 600:1, TP 280 psi., Goen lime 4,190-91 ft. TD 4,194 ft. New oil discovery.

Schleicher County:

Bell & Dansfiell and Adobe Oil Co. 1 J. H. Treadwell, 5 miles north of Fort McKavitt in Sec. 68, C. E. Treadwell Sur. IPCAOF 2,180 M.c.f.d., Canyon sand 4,098-4,122 ft. TD 4,500 ft. New gas discovery.

Scurry County:

Texaco Inc. 252 P. L. Fuller, NCT-1, 14 miles north of Snyder in Sec. 561, Blk. 97, H&TC Sur. IPF 262 BOPD, 18/64-in. choke, 43.6°, GOR 552:1, TP 100 psi., packer. 5,029-34 ft. New oil discovery.

Taylor County:

William D. Austin et al. 1 Frank Antilley, 30 miles southwest of Abilene in W. W. Marshall Sur. IPP 38 BOPD, plus 60% water, 44°, Fry sand 4,828-29 ft. TD 4,890 ft. New oil discovery.

Terrell County:

Sinclair Oil & Gas Co. 1 Alma H. Poulter, 20 miles southwest of Sheffield in Sec. 21, Blk. 1, TCRR Sur. IPCAOF 4,850 M.c.f.d., Wolfcamp 6,221-72 ft.; IPCAOF 10,500 M.c.f.d., Ellenburger 14,174-14,596 ft. TD 14,873 ft. Dual gas discovery.

Tom Green County:

Texaco et al. 1-B N. G. Kent, NCT-8, 16 miles southeast of San Angelo in Sec. 197, Blk. 11, SPRR Sur. IPP 109 BOPD, 40.3°, GOR 853:1, Strawn 4,708-28 ft. TD 4,841 ft. New oil discovery.

Yoakum County:

Pan American 1-A J. L. Gammon, 6 miles northeast of Denver City in Sec. 675, Blk. D., J. H. Gibson Survey. IPP 215 BOPD, plus 2% water, 39.5°, GOR 214:1, Wolfcamp 9,267-82 ft. TD 12,357 ft. New oil discovery.

Ward County:

Gulf Oil Corp. 528 Hutchings Stock Association, 5 miles south of Monahans in Sec. 55, Blk. N, G&MMB&A Sur. IPP 82 BOPD, plus 10% water, 36.6°, Queen open hole sand 3,108 ft. TD 7,494 ft. PB 3,137 ft. New oil discovery.

UTAH

Grand County:

Pan American Petroleum Corp. 1 Salt Wash, C NW SW 15-23s-17e. IPF 115 BO, 9 BWPD, 20/64-in. choke, TP 795 psi., CP 1,050 psi., 53°, GOR 11,780:1, Mississippian 8,693-8,707 ft. TD 9,523 ft. Mississippian discovery, new field.

Grand County, Book Cliffs unit:

Great Yellowstone Corp. 1 unit, SE SE 32-18s-22e. IPF 1,800 M.c.f.d., ¼-in. choke, CP 1,280 psi., Dakota Cretaceous 5,186-5,234 ft. TD 5,700 ft. Dakota discovery, new field.

WYOMING

Niobrara County:

Exeter Drilling Co. 1 Anderson, NE NW 15-35n-63w. IPP 30 BOPD, first Leo sand discovery, 2,636-38 ft. New field. TD 2,723 ft.

This announcement is not an offer of securities for sale or a solicitation of an offer to buy securities.

New Issues August 3, 1961

Texas Eastern Transmission Corporation

$30,000,000 5⅜% Debentures due August 1, 1981

200,000 Shares Preferred Stock, 5.125% Subordinate Convertible Series

(Par Value $100 Per Share)

The Preferred Stock is convertible into Common Stock at $20.00 per share on or before August 1, 1966, at $22.50 per share thereafter and on or before August 1, 1971 and at $25.00 thereafter and on or before August 1, 1976, subject to earlier redemption.

Prices:

100% for the Debentures

$100 per share for the Preferred Stock

plus accrued interest on the Debentures from August 1, 1961 and accrued dividends, if any, on the Preferred Stock from date of issue

Copies of the prospectus may be obtained from such of the undersigned (who are among the underwriters named in the prospectus) as may legally offer these securities under applicable securities laws.

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Hees Mixes Politics and Oil

. . . and comes up with quite a record for boosting Canada's oil production. He's a business man turned politician.

THE MAN most responsible for boosting Canada's lagging oil production this year is not an oil man but a government official—the Honorable George Hees, Minister of Trade and Commerce.

His national oil policy, exerting pressure on importers to cut the flow of foreign oil into Ontario and boost exports to the U. S., is expected to lift production by 16% this year (p. 134).

Hees didn't give western independent backers of an Alberta-Montreal crude line all they wanted—the 250,000-bbl.-daily Montreal market now supplied from foreign sources. But in putting the heat on importers to expand markets for Canadian crude by that amount over a 3-year period, he demanded compliance "or else."

The "or else" alternative was imports controls, and its effect has been almost magical.

George Hees

Preparation for politics . . . The author of this tough-minded, nonsense policy is a wealthy businessman turned politician.

At 51, he cuts a strikingly handsome figure on the Canadian stage, and his political star has not yet reached its zenith.

Born in Toronto in June 1910, Hees was educated at Trinity College School, Port Hope, Ont., the Royal Military College of Canada; the University of Toronto; and Cambridge University.

In his youth he was an outstanding and versatile athlete. He played football for the University of Toronto and the professional Toronto Argonauts on their dominion championship team of 1938. At Cambridge he was British Intercollegiate boxing champion.

In World War II Hees served as a brigade major of the Fifth Infantry Brigade. A wound received in 1944 in the Netherlands ended his military career, and he was evacuated to Canada.

The next year he resigned as head of George H. Hees Co., Ltd., a manufacturer of drapery and upholstery goods and window shades—founded by his grandfather—to enter politics.

As a young man with a background of business success, athletic prowess and renown, a distinguished war record, and immense personal charm, his rapid rise in politics was predictable.

Political career . . . Hees was first nominated as a Progressive-Conservative candidate for the House of Commons in 1945.

In 1950 he ran a successful race in the Broadview constituency of Toronto, and was reelected three times. When he entered Commons his party, languishing from its long period out of power, badly needed revitalizing.

Hees accepted the challenge to help reorganize the party. He worked hard at rebuilding strength at the grass-roots level, and is credited in large measure with getting the party ready to contest the Liberals for control.

From 1954 to 1956, he was president of the Progressive-Conservative Association—head of his party outside Commons. When that party came to power in June 1957, for the first time in 22 years, he was predestined for a key role in the new government.

He was named Minister of Transport at that time and on October 12, 1960, he was appointed Minister of Trade and Commerce.

Hees has brought the same drive to stimulating a lethargic economy that he applied to his political party. He has stumped the country in trade-promotion conferences, uncovering opportunities and goading business to plunge into world trade to pare a burdensome $1-billion annual trade deficit.

Oil pronouncement . . . Hees found the oil industry to be one of the worst culprits in the deficit, with imports last year of 434,000 bbl. daily and exports of only 121,000 bbl. daily.

Although this balance was a vast improvement over that of 15 years ago, when virtually all supplies were imported, the government was on the spot to help the domestic industry. Mainly as a result of the national oil policy invoked last February 1, exports over the next 3 years will double and imports will level off.

Hees has suddenly become an important influence in North American oil. He will become even more deeply involved in oil affairs if the voluntary oil policy fails and he is forced to resort to his "or else" threat of imports controls—a step which he himself would not relish.

Although the minister is known more as a "good fellow" than a hard-boiled official, the industry is taking him at his word.

●

B. A. Maas, Jr., regional engineer in Kansas City for American Oil Co., has been named chief engineer, planning and projects, for American's marketing department in Chicago. He succeeds **W. R. King,** recently named operations and administrative manager in Los Angeles.

Jan S. Oostermeyer has been named manager of Shell Chemical Co.'s Los Angeles industrial-chemical district. **Thomas H. Butler** has been named manager of the San Francisco district. Both formerly were on the sales staff in New York.

Personals

Graham B. Moody, Berkeley, Calif., consulting petroleum geologist and engineer, has been elected chairman of Buttes Gas & Oil Co. He will also be a member of the executive committee. **Jeff Watts,** general manager, has been elected president and a director. Watts succeeds **M. J. van Loben Sels,** who will continue as a director. Moody is a former reserves engineer for Standard Oil Co. of California and is past president of American Association of Petroleum Geologists. He was elected a director of Buttes earlier this year.

MOODY

Pitt A. Curtiss has been named manager of consumer sales in the home office marketing department of Standard Oil Co. (Ohio), Cleveland. **Donald T. McClurg** will succeed Curtiss as manager of the sales-technical division.

R. E. France, superintendent of California Co.'s Delta Gulf Coast production division, has been given a temporary assignment with Standard Oil Co. of California in San Francisco. **J. L. LeBlanc** will take over as acting superintendent for the Delta Gulf Coast division. In San Francisco, France will serve on the staff of **Gage Lund,** California Standard's vice president for exploration and production.

Ralph House, group supervisor in the chemicals product-development and technical-service section of California Research Corp.'s Richmond, Calif., laboratory, has been named research associate in the chemicals division. In other appointments at Richmond, **J. E. Hanson** has been named technical assistant to the manager of the chemicals-research division; **Dr. R. T. Adams** has been named supervising research chemist in chemicals process development; and **G. B. Johnson** has been appointed supervising research chemist, chemicals product development. **Dr. R. J. Miller** has been named coordinator of research projects in chemicals research. At the La Habra, Calif., laboratory, **Dr. J. W. C. Sherwood** has been named senior research physicist, theoretical and experimental seismology, in the geophysics-research section.

George Darrow, Billings, Mont., consulting geologist, has been elected president of the Yellowstone-Bighorn Research Association. He succeeds **W. E. Bonini,** Princeton University.

J. D. DeGrandis, manager of services for British American Oil Co.'s crude and products-supply department, has been named manager of product supply. He will headquarter in Toronto.

F. W. Stewart, Cities Service Petroleum Co.'s Oklahoma City area representative of the crude-oil supply division, will take on additional responsibility for the Kansas area. **C. B. Kirby,** Kansas area representative, has retired after 40 years with the company.

W. G. McMahon has been elected president of Leduc Calmar Oil Co., Ltd. **R. S. Rapp** has been named executive vice president; **J. McLeod,** vice president; and **J. Stronach,** secretary-treasurer. Directors are McLeod, McMahon, Rapp, **L. W. Lee** and **J. E. Prothroe.**

Dr. M. King Hubbert, consultant in general geology for Shell Development Co., has been appointed visiting professor of geology and geophysics at Stanford University for the winter quarters of 1961-62 and 1962-63 academic years. Hubbert will be in residence at Stanford during these periods but will continue as consultant to Shell Development. Hubbert taught geology and geophysics at the University of Chicago and Columbia University before joining Shell 17 years ago. He has been visiting lecturer at many universities, including Stanford, and has twice been a distinguished lecturer of American Association of Petroleum Geologists.

CLARK

Durland E. Clark, Pacific Coast area land agent for Shell Oil Co., has been named assistant to the vice president of the Pacific Coast area, with headquarters in Los Angeles. He succeeds **P. A. Dennie,** recently named Denver area production manager. Clark joined Shell in 1948 in Los Angeles. He has been an area land agent since 1958.

Victor E. Schermerhorn, area supervisor for Standard Oil Co. (Ohio) in Oklahoma City, has been promoted to manager of the crude-oil supply section in the home office, Cleveland. Schermerhorn has been with Ohio Standard since 1947.

John I. Fisher, superintendent of gas contracts and production engineer in the Oklahoma City production office of Kerr-McGee Oil Industries, has been transferred to Morgan City, La., as Gulf Coast division production manager, a new position. **G. Emery Guidry** will continue as superintendent of the Gulf Coast production division.

E. L. Dildine has been named manager of crude-oil purchases and sales for Standard Oil Co. of Texas. He succeeds **R. E. Caraway,** who has been transferred to San Francisco where he will be responsible for procurement and distribution of lube-oil stocks for Standard Oil Co. of California. **R. L. Mays** will succeed Dildine as assistant manager of crude-oil purchases and sales for Sotex.

Joe E. Penick and **A. E. (Tommy) Thompson,** refinery managers for Mobil Oil Co., have exchanged jobs. Penick will move from Augusta, Kans., to Torrance, Calif., as manager of the refinery there. Thompson, Torrance, will move to Augusta as manager. Penick has been with the Mobil companies since 1942. He was manager of the East Providence, R. I., refinery before becoming manager at Augusta in 1959. Thompson has been with Mobil and its affiliates since 1934. He became manager of the Torrance refinery in 1949.

▶▶▶ Personals

O. Maurice Joy has joined Atlantic Refining Co. in Dallas as engineer trainee.

L. Lynn Elliott has been named vice president and general counsel of Tower Oil & Gas Co. of Texas.

Josef Krabe, senior engineer with American Oil Co. in Texas City, has retired after 31 years with the company.

John C. Rudolph, general manager of exploration and a director of Banff Oil, Ltd., Calgary, has been elected president. Presidency of the company has been vacant since the resignation of **W. H. Hohag, Jr.,** in January 1960. Rudolph joined Banff Oil in 1954 as geologist in charge of exploration.

R. B. Nesbitt has been promoted to supervising engineer in the cracking and light-ends department, process technical division, at Humble's Baytown, Tex., refinery. **S. W. Dedman** has been promoted to assistant general foreman of the solvents department at Baytown, and **J. S. Keating** has been named assistant general foreman of the butyl and butadiene department, process division.

NESBITT

J. S. Hoppock, manager of Shell Oil Co.'s Minneapolis marketing division, has been named manager of the northeastern division, Boston. He succeeds **R. F. Carey. C. L. Towers, Jr.,** managing director of Shell Co. (Puerto Rico), Ltd., has been named to succeed **R. D. Kizer** as manager of the Atlanta division. **E. J. Cowing,** sales assistant to the eastern regional marketing vice president, will succeed Towers in Puerto Rico. **P. G. Drew,** sales assistant to the western regional marketing vice president, has been named to succeed **H. S. Haight** as manager of the San Francisco division. **A. P. Hynes,** manager of the Honolulu division, has been named Los Angeles division manager. He succeeds **R. D. Stetson.** Carey, Kizer, Haight and Stetson will retire within the next several months.

D. M. (Bud) McDonald has been named division manager of Clark Oil & Refining Corp.'s Canadian operations. He will headquarter in Calgary.

G. G. McClaflin, associate research scientist in Continental Oil Co.'s research and development department, has been promoted to research scientist. **J. R. Bowden** has been named research group leader in the department.

C. R. Totebusch, Jr., assistant to the regional land manager for Atlantic Refining Co. in Midland, Tex., has been promoted to south Permian district land man. He will continue to headquarter in Midland.

H. A. Kuehnert has been promoted to division development geologist for Phillips Petroleum Co. in Denver. He succeeds **Frank Earle, Jr.,** who recently resigned.

Louis P. Herin and **Dr. Rudolph S. Wilsher,** chemists, have joined Esso Research & Engineering Co.'s chemicals-research division. **Dr. J. H. Van der Hende** has joined the central basic-research laboratories, and **Abraham A. Zimmerman** has joined the special-projects unit.

Gerald B. Bellis, lead construction engineer in California Co.'s New Orleans engineering department, has been transferred to Harvey, La., as assistant division construction engineer for the Delta Gulf Coast division. He succeeds **William D. Wilkinson,** who has been transferred to Leesville, La., as production supervisor for the Bay Marchand area.

Continental Oil Co. has consolidated its Salt Lake City and Denver exploration divisions into a single division headquartered in Denver. Moving from Salt Lake City to Denver will be **R. K. Aaker,** who will be division geologist; **A. P. Lorfing,** division land superintendent; and **L. D. Oster,** division geophysicist. **T. R. Carpen,** Denver, has been named assistant division geologist. **J. W. Dupuy,** Denver, will be assistant land superintendent. The new division will handle exploration in Idaho, Utah, and Colorado, except for Paradox basin.

P. H. Bohart, administrative vice president and coordinator of Gulf Oil Corp., has been named senior vice president. **P. H. Clancy** has been named coordinator, crude-oil department. Bohart will be responsible for executive supervision of the crude-oil department. Bohart has been with Gulf since 1919. He has been vice president in charge of the production division in Tulsa and headed the planning and economics department in Pittsburgh at one time. Both Bohart and Clancy will continue to headquarter in Pittsburgh.

BOHART

M. H. Wales, assistant chemist in Dow Chemical Co.'s light-hydrocarbon department, Plaquemine, La., has been promoted to chemist in the department.

Amel R. Meyer has been named section head in American Oil Co.'s research and development department, Whiting, Ind. He will head research and development on metals and their use in refinery construction and maintenance.

Harvey A. Campbell, superintendent of the plant process-engineering department at Texas Butadiene & Chemical Corp.'s Lyondell plant near Channelview, Tex., has been named operations superintendent of the plant. **John T. Shelton,** process engineer, will succeed Campbell. **W. J. Brack,** assistant to the production superintendent, has been named assistant to the operations superintendent.

G. H. Jefferis, superintendent of the manufacturing and utilities section in California Oil Co.'s eastern division refining department, has been named superintendent of catalytic operations. He succeeds **D. B. Edmondo,** who has been transferred to San Francisco. **R. W. Keck,** senior operations planner, will succeed Jefferis. **C. A. Petersen, Jr.,** senior engineer of the designs section, will succeed Keck.

Personals

TARBEL

Brook D. Tarbel has joined **J. W. W. Whitney, Jr.,** as a partner in Whitney Operating Co., Tulsa. The company specializes in contract operations and producing property management. Tarbel has been with Helmerich & Payne, Inc., in Tulsa for the past 4 years. He was with the old Magnolia Petroleum Co. before that time.

F. O. McKeany, Shell Oil Co.'s assistant manager of pipelines, Los Angeles, has been elected president of Western Pipeliners' Club.

James M. Culver has joined Esso Research & Engineering Co. as research engineer in Linden, N. J.

Clifton D. Norris, supervising engineer in Texaco's Houston engineering department, has retired after 40 years with the company.

L. A. Kuebler has been named assistant division geologist for Texaco's Midland, Tex., division. **R. B. Franklin,** assistant division geologist in New Orleans, will succeed Kuebler as geologist in the general manager's office in Houston. **D. F. Beaumont,** district geologist in Lafayette, La., will succeed Franklin.

G. E. Burpee, assistant to the vice president of Shell Oil Co. in Houston, has retired after 29 years with the company. Burpee was Houston area production manager before becoming assistant to the vice president last year. He also has served Shell as Calgary area production manager and Houston chief exploitation engineer.

Norton R. Perry, geologist with Mobil Oil Co. in Pittsburgh, has been transferred to Oklahoma City.

Warren L. Snider, technological manager at Shell Oil Co.'s Norco, La., refinery, has been transferred to the Martinez, Calif., refinery as chief technologist. He succeeds **L. R. Gray,** who has retired after 36 years with the company. **Glen E. Dillon** has been named assistant manager of the compounding department at Martinez. He succeeds **Henry Haussman,** who has retired.

Robert M. Taubman has formed Robert M. Taubman & Associates, exploration and production firm, in Midland, Tex. Taubman has been a vice president of Buffalo Petroleum Corp. and manager of its West Texas-New Mexico division in Midland. Buffalo's Midland office was recently closed and the Taubman company will supervise operation of Buffalo properties in the area. **Neal Taylor,** Buffalo division production superintendent in Midland, has joined the Taubman firm as engineer. **Curtis Espy,** Buffalo division geologist, will be in charge of exploration.

Ralph M. Wright has been named general manager of Uinta Oil Refining Co., a subsidiary of Utah Cooperative Association. Wright was with E. R. Cox Associates, Salt Lake City consulting firm, and Continental Oil Co. before joining Uinta.

Robert H. Williams, district engineer for Humble in Jackson, Miss., has been transferred to Laurel, Miss., as district engineer, production.

Bernard Ostrofsky has been named senior project supervisor in American Oil Co.'s research and development department, Whiting, Ind.

Charles E. Remington has been named chief of the division of engineering in Interior Department's Bureau of Land Management. He will direct surveys of more than 500 million acres of public land in the western states and Alaska.

Walter G. Ainsley, automotive-research coordinator for Sinclair Research, Inc., has retired after 35 years with the company. **M. L. Hamilton** will succeed Ainsley. Hamilton, with Sinclair since 1934, has served as assistant director of engine laboratories, assistant director of the products division, and director of aircraft-engine laboratories.

Deaths

Harry Keith Abernethy, 55, chief engineer and general manager of Piping Engineering Co., Tulsa, died August 4 at his home in Tulsa after a long illness. Abernethy was with Midland Cooperatives, Inc., in Cushing, Okla., and had also been with Champlin Oil & Refining Co. in Enid, Okla., and the old Mid-Continent Petroleum Corp. in Tulsa before joining Piping Engineering.

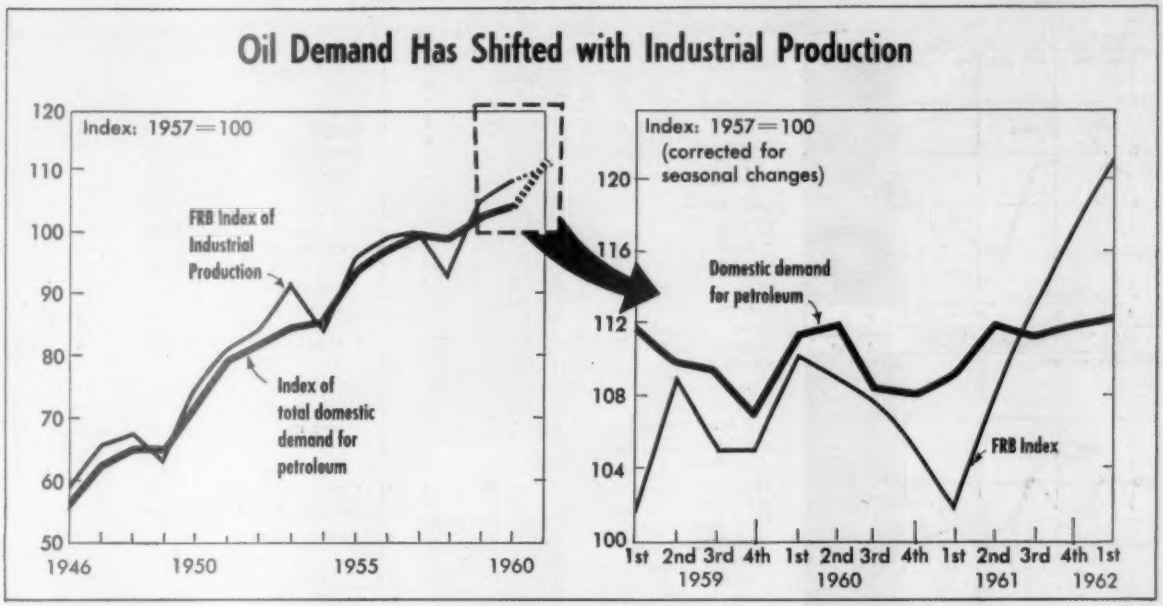
Glenn W. Daniel, 68, a director of Daniel Orifice Fitting Co. of Houston, was killed July 30 in an auto accident near Kerrville, Tex., his home. Daniel joined the firm in 1933 and was elected a director in 1957. His brother, the late Paul Daniel, was founder of the company.

Philip C. Kenton, 50, assistant purchasing agent for Warren Petroleum Corp., died August 8 in Tulsa after suffering a heart attack. Kenton had been with Warren 11 years. Kenton was president of the Tulsa Purchasing Agents Association.

Harry T. (Dan) Moore, 49, assistant marketing manager for Humble's New Orleans area, died August 6 in a New Orleans hospital. Moore had been with Humble and its affiliates 31 years. He was New Orleans area sales manager before becoming assistant marketing manager.

C. E. Free, 89, pioneer oil operator in Kentucky, Texas, Oklahoma, and Michigan, died recently in an El Paso, Tex., hospital. Free was active in Kentucky drilling as recently as 1956.

Herman Jacobson, 79, retired Shell Oil Co. executive in New York, died August 3 in Wassenaar, Holland, where he had gone on a visit. Jacobson was Royal Dutch-Shell representative in Romania during World War I. He retired from Shell in New York in 1947.



Oil-demand growth: steady, not flashy

BY JOHN C. CASPER

DEMAND for petroleum products moves up and down with changes in the general economy, but as a general rule, the swings in oil demand are not as severe as the shifts in general-economic indicators.

This general characteristic of petroleum demand is back of most of the conservative estimates of demand for the remainder of 1961 and early months of 1962.

To get a picture of petroleum's reaction to changes in the over-all economy, consider the major dips shown in the first chart. Lines on this chart represent indexes of total industrial production and total demand for petroleum products.

There were three sharp dips in industrial production, corresponding to the three distinct recessions since the end of World War II. These dips were spaced 4 to 5 years apart. The first was in 1949, followed by a second sharp dip in 1954, and a third in 1958. In each case the FRB Index of Industrial Production dropped enough to give a definite "V" in the curve.

Each of these dips in industrial production caused a sag in demand for petroleum, but in every case the reduction in petroleum demand was less than the drop in over-all production.

Both lines in the first chart are plotted as indexes with 1957 equal to 100. With 1957 as the base year, oil demand for the early postwar years ran lower than general industrial production. But, declines in oil demand during the recession periods were much less than declines in the FRB index.

These general relationships from past years may give a clue to what may be expected from oil during the expansion period that has been forecast for industrial production through 1962.

Industrial production was down in the fourth quarter of 1960 and the first quarter of 1961. It made a definite recovery in the second quarter and is expected to continue its rise at least through the first quarter of 1962.

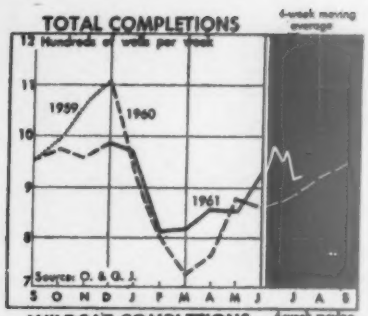
These increases for 1961 and 1962 are shown at the end of the lines on the left chart and have been enlarged and plotted by quarters in the right chart.

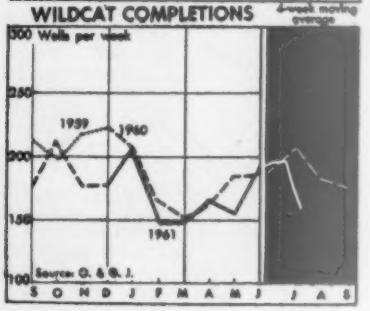
Note that demand did not drop as low as general production in the first quarter of this year. Also demand will not climb as fast as production between now and next spring.

Since demand did not drop in the first quarter, the average for the year will show more gain than the FRB index.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,039,310	UP	75,160	UP	103,858
Crude stocks	256,181,000	DOWN	566,000	UP	13,360,000
Completions	961	UP	88	UP	79
Refinery runs	8,466,000	UP	69,000	UP	212,000
Gasoline stocks	193,042,000	DOWN	1,098,000	DOWN	605,000
Kerosine stocks	32,300,000	UP	436,000	UP	1,598,000
Distillate stocks	132,875,000	UP	2,843,000	DOWN	1,174,000
Residual stocks	49,472,000	DOWN	754,000	UP	6,458,000
Four-product stocks	407,689,000	UP	1,427,000	UP	6,277,000
Total imports	1,673,800	DOWN	517,200	DOWN	134,500





Active Rotary Rigs

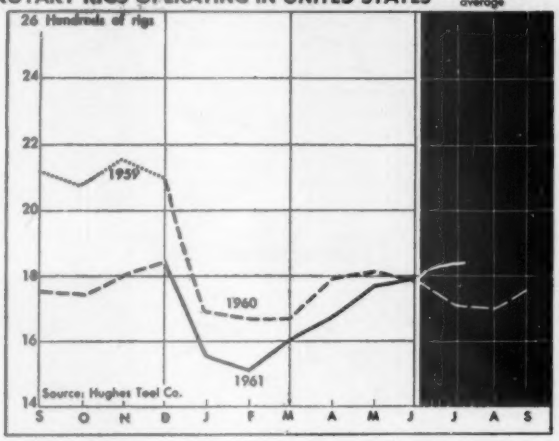
	8-7-61	7-31-61	8-8-60
Alabama	4	4	4
Alaska	11	11	7
Arkansas	12	11	12
Arizona	0	0	1
California	74	78	78
Land	70	73	76
Offshore	4	5	2
Colorado	31	29	36
Florida	1	0	2
Land	0	0	2
Offshore	1	0	0
Illinois	37	41	41
Indiana	10	10	13
Iowa	2	1	0
Kansas	107	108	106
Kentucky	3	2	2
Louisiana	267	265	301
North	38	37	46
S. Inland waters	106	105	115
S. Land	73	71	85
Offshore	50	52	55
Maryland	0	0	1
Michigan	28	32	48
Mississippi	63	57	63
Missouri	3	3	1
Montana	25	26	22
Nebraska	16	20	28
New Mexico	113	114	105
New York	1	1	0
North Dakota	17	15	16
Ohio	8	8	5
Oklahoma	216	205	165
Oregon	0	0	1
Pennsylvania	7	7	13
South Dakota	1	0	0
Texas	678	697	560
S. Inland waters	7	8	3
S. Land	196	197	171
Offshore	2	2	0
North	64	67	42
Panhandle	72	74	45
East	70	69	41
West Central	159	164	158
West	108	116	100
Utah	34	35	26
Washington	1	1	1
West Virginia	13	13	4
Wyoming	66	53	66
Total U. S.	1,849	1,847	1,728
Cum. avg. to date	1,685	1,680	1,735
Western Canada	128	143	184
Eastern Canada	2	2	0
Grand total	1,979	1,992	1,912

Hughes Tool Co. report.

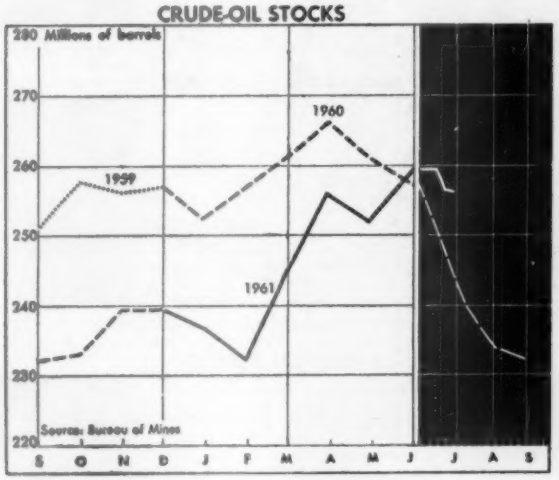
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 5, 1961

	Total wells							1961	1960	Total wildcats					1961	1960
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Cum.		Total	Crude	Cond.	Gas	Dry	Cum.	
Alabama	0	0	0	0	0	0	0	31	28	0	0	0	0	0	7	1
Alaska	0	0	0	0	0	0	0	24	.....	0	0	0	0	0	3	.....
Appalachian	19	2	0	14	3	0	61,520	1,252	1,053	1	0	0	0	1	48	38
Arizona	0	0	0	0	0	0	0	13	25	0	0	0	0	0	8	18
Arkansas	11	3	0	0	8	0	45,385	297	363	5	0	0	0	5	61	99
California	29	20	0	2	7	0	98,555	968	986	2	0	0	0	2	155	182
Colorado	11	1	0	2	8	0	51,394	365	370	4	0	0	0	4	174	185
Illinois	40	15	0	0	25	0	110,002	1,122	1,247	20	0	0	0	20	248	266
Indiana	22	17	0	0	5	0	41,111	402	576	0	0	0	0	0	108	220
Kansas	140	53	0	7	70	10	315,322	3,154	1,897	19	2	0	0	17	580	619
Kentucky	121	0	0	0	0	121	121,007	1,190	1,010	0	0	0	0	0	85	113
Louisiana	33	15	0	7	11	0	176,814	2,164	2,072	5	0	0	0	5	340	328
North	24	11	0	5	8	0	80,815	864	757	5	0	0	0	5	146	156
South	9	4	0	2	3	0	95,999	993	1,012	0	0	0	0	0	161	150
Offshore	0	0	0	0	0	0	0	307	303	0	0	0	0	0	33	22
Michigan	23	5	0	1	9	8	59,537	427	502	9	1	0	0	8	159	140
Mississippi	6	3	2	0	1	0	59,111	324	420	0	0	0	0	0	107	156
Montana	7	3	0	0	4	0	23,976	221	180	3	0	0	0	3	105	88
Nebraska	18	6	0	0	12	0	68,280	601	508	11	0	0	0	11	287	213
New Mexico	36	9	0	20	7	0	197,292	1,053	1,099	5	0	0	2	3	177	169
West	18	0	0	18	0	0	73,843	470	367	0	0	0	0	0	56	40
East	18	9	0	2	7	0	123,449	583	739	5	0	0	2	3	121	129
North Dakota	2	2	0	0	0	0	16,229	155	180	0	0	0	0	0	40	46
Ohio	22	14	0	4	3	1	62,617	609	596	0	0	0	0	0	27	33
Oklahoma	150	115	0	0	35	0	402,225	3,539	2,795	0	0	0	0	0	344	457
Texas	257	139	7	16	95	0	1,262,027	8,656	9,510	43	2	1	4	36	1,781	1,975
Dist. 1	12	4	0	2	6	0	45,789	527	651	7	0	0	2	5	206	248
Dist. 2	16	7	1	3	5	0	83,534	473	451	8	1	1	1	5	125	110
Dist. 3	26	16	3	0	7	0	161,866	707	734	3	1	0	0	2	137	139
Dist. 4	38	13	1	7	17	0	257,214	754	640	12	0	0	1	11	177	182
East	25	16	0	0	9	0	147,554	746	765	7	0	0	0	7	181	161
Dist. 7-B	17	7	1	0	9	0	58,180	1,099	1,389	6	0	0	0	6	298	392
West	48	41	0	0	7	0	283,877	2,126	2,508	0	0	0	0	0	452	395
Dist. 9	60	30	0	0	30	0	137,161	1,515	1,750	0	0	0	0	0	151	308
Dist. 10	15	5	1	4	5	0	86,852	709	622	0	0	0	0	0	54	40
Utah	0	0	0	0	0	0	0	150	156	0	0	0	0	0	68	54
Wyoming	13	11	0	0	2	0	38,139	574	619	1	0	0	0	1	214	251
Misc. (Mo.)	1	0	0	0	1	0	1,987	119	106	1	0	0	0	1	106	87
Total U. S.	961	433	9	73	306	140	3,212,530	27,410	26,298	129	5	1	6	117	5,232	5,738
Previous week	873	371	14	83	268	137	3,338,980	.....	.....	138	11	2	7	118	.....	.....
Cum. 1961	27,410	12,266	565	2,699	9,802	2,078	109,696,647	.....	.....	5,232	450	59	240	4,483	.....	.....
Cum. 1960	26,298	12,127	790	2,141	10,216	1,024	112,758,757	.....	.....	5,738	513	64	187	4,974	.....	.....
Western Canada	83	56	0	7	19	1	505,000	1,317	1,351	17	2	0	3	12	337	370

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	7-29-61	7-22-61	7-30-60
Pennsylvania	2,461	2,426	2,201
Other Appalachian	1,777	1,777	1,768
Illinois, Indiana, Michigan	10,601	10,924	9,201
Nebraska and North Dakota	3,658	3,235	2,668
Kansas	9,752	9,733	9,028
Oklahoma	17,124	17,268	16,767
Arkansas	1,907	2,013	1,845
Louisiana	21,109	21,642	17,738
North	3,718	3,765	3,127
South	17,391	17,877	14,611
Mississippi, Alabama, Florida	2,002	2,237	2,286
New Mexico	7,674	8,063	8,244
Texas	109,395	110,163	102,420
East Texas	9,593	9,472	8,312
West Texas	47,299	48,835	47,656
Texas Gulf	19,769	19,691	16,700
Other Texas	32,734	32,165	29,752
Wyoming	17,219	18,067	16,846
Other Rocky Mountain	9,982	10,430	10,367
California	24,316	23,578	27,978
Foreign	†17,204	15,191	13,464
Total	**256,181**	256,747	242,821

*Bureau of Mines. †Includes 5,257,000 bbl. in California.

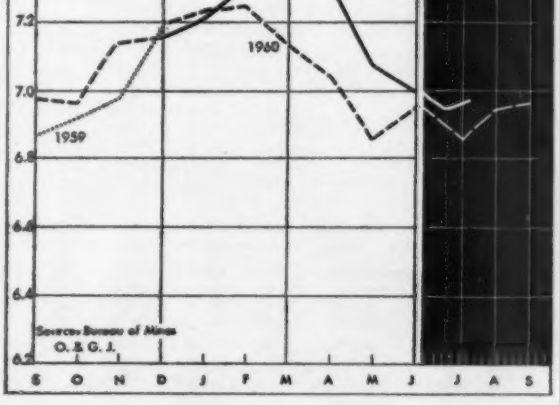
DAILY AVERAGE PRODUCTION FOR WEEK

	August 5, 1961 Crude oil	Lease condensate	Total	July 29 total
Alabama	19,425	.....	19,425	19,400
Alaska	19,200	.....	19,200	19,000
Arkansas	78,050	100	78,150	78,100
California	817,500	.....	817,500	817,800
Colorado	126,500	.....	126,500	128,200
Eastern	39,900	.....	39,900	40,800
Florida	1,000	.....	1,000	1,000
Illinois	209,100	.....	209,100	208,100
Indiana	29,300	.....	29,300	29,300
Kansas	†312,110	.....	†312,110	†302,275
Kentucky	50,700	.....	50,700	49,200
Louisiana	995,600	137,675	1,133,275	1,125,450
North	106,325	5,175	111,500	111,450
South	889,275	132,500	1,021,775	1,014,000
Michigan	53,300	.....	53,300	53,600
Mississippi	146,725	3,650	150,375	150,500
Montana	86,300	.....	86,300	85,800
Nebraska	61,500	.....	61,500	63,400
Nevada	450	.....	450	450
New Mexico	306,425	7,500	313,925	302,100
North Dakota	54,800	.....	54,800	55,000
Oklahoma	†515,250	.....	†515,250	†509,000
Texas	2,392,300	89,650	2,481,950	2,447,300
Dist. 1	42,000	2,600	44,600	44,600
Dist. 2	98,725	7,900	106,625	104,800
Dist. 3	307,925	38,000	345,925	339,500
Dist. 4	172,350	12,500	184,850	180,000
Dist. 5	27,000	600	27,600	27,600
Dist. 6	108,500	8,000	116,500	110,500
East Texas field	125,650	.....	125,650	122,500
Dist. 7-B	124,150	400	124,550	123,350
Dist. 7-C	106,425	3,450	109,875	114,150
Dist. 8	993,150	12,000	1,005,150	1,004,000
Dist. 9	181,425	2,500	183,925	169,500
Dist. 10	105,000	1,700	106,700	106,800
Utah	85,600	.....	85,600	79,400
Wyoming	399,000	.....	399,000	398,300
Others	‡700	.....	‡700	‡675
Total U. S.	6,800,735	238,575	**7,039,310**	6,964,150
Change from prev. week, up			**75,160**	
Canada	†569,600	.....	†569,600	†645,200

Total U. S. prod., January 1-Aug. 5 ..... 1,562,099,200 bbl.
Same period last year (crude plus cond.) ..... *1,534,014,300 bbl.

*Includes 49,721,400 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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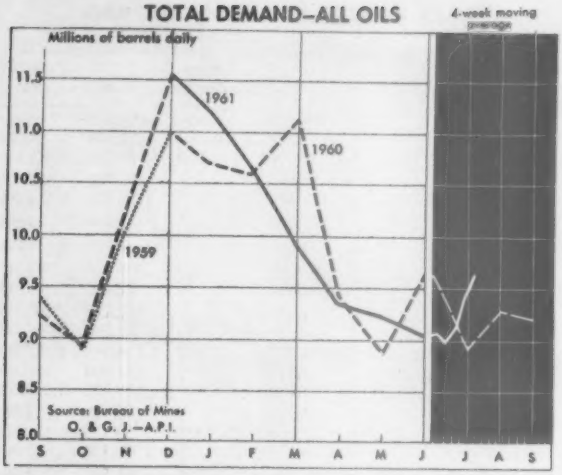
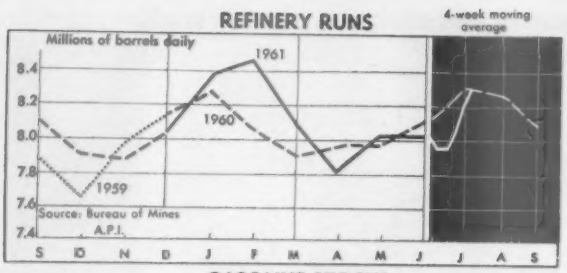
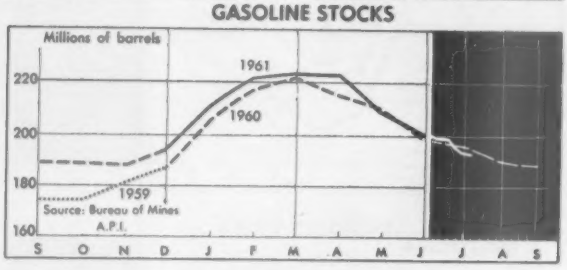
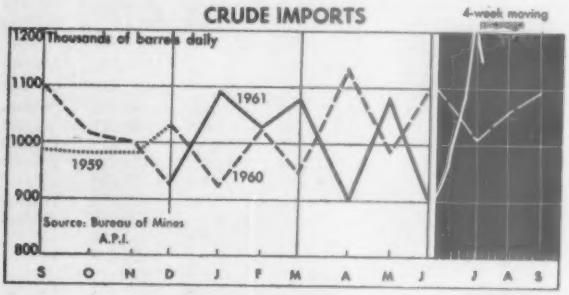
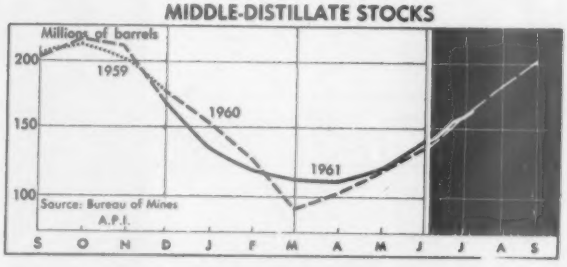
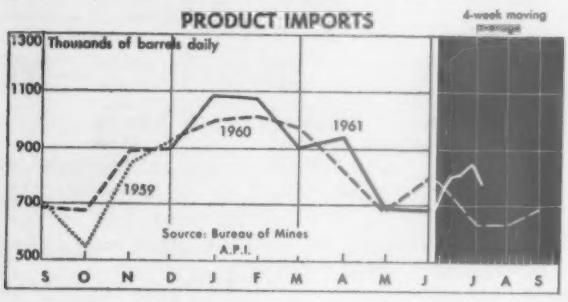


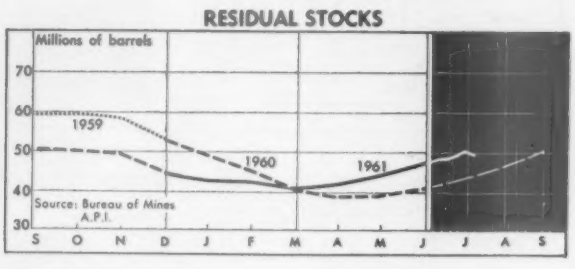












API REFINERY REPORT—AUGUST 4, 1961
(Thousands of Barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,135	562.4	34.3	369.8	147.6	45,698	11,052	42,353	12,726	1,128	490.0	33.8	299.7	140.4
Appalachian:														
District 1	65	26.7	3.4	18.0	4.0	5,526	631	2,889	405	94	41.2	3.1	22.5	8.0
District 2	109	57.4	2.6	22.9	9.4	2,650	416	1,174	320	109	53.5	3.8	19.7	10.5
Ind., Ill., Ky.	1,546	815.9	69.7	344.7	138.4	31,957	6,397	23,804	5,718	1,511	693.1	64.8	262.0	130.9
Minn., Wis., Dak.	131	65.3	6.7	30.6	15.7	7,125	1,465	6,665	767	132	38.5	2.0	17.7	15.2
Okla., Kans., Mo.	775	433.1	15.4	187.0	20.0	17,659	1,718	11,641	960	752	384.8	13.7	150.5	16.8
Inland Texas	327	227.1	14.4	50.6	22.9	7,276	624	1,726	2,671	308	211.3	8.3	49.7	21.2
Texas Gulf Coast	1,974	1,043.8	107.8	539.7	139.7	26,895	4,071	16,207	5,131	1,886	972.7	87.7	448.1	137.1
La. Gulf Coast	728	365.7	82.1	160.3	45.1	9,987	2,746	5,824	1,128	679	390.6	53.0	139.1	47.5
N. La. and Ark.	118	67.4	4.4	25.0	7.0	6,039	746	2,512	156	109	69.4	3.7	26.4	6.8
Rocky Mountain:														
New Mexico	28	14.9	0.6	6.0	2.9	657	42	217	43	26	12.5	0.4	4.2	2.1
Other Rocky Mt.	303	144.4	12.7	59.4	33.0	6,179	630	2,842	1,101	313	139.6	6.5	60.8	34.7
West Coast	1,227	551.0	36.9	191.3	301.0	25,394	1,762	15,021	18,346	1,203	563.4	39.1	204.9	285.3
Aug. 4, 1961	8,466	4,375.1	391.0	2,005.3	886.7	193,042	32,300	132,875	49,472	8,250	4,060.6	319.9	1,705.3	856.5
July 28, 1961	8,397	4,349.9	390.3	1,887.7	820.3	194,140	31,864	130,032	50,226	.....	.....	.....	.....	.....
Aug. 5, 1960	8,254	4,148.6	356.0	1,839.0	829.3	193,647	30,702	134,049	43,014	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14.14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	(†)	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	.281	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33-9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Two buyers announced increase.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Breckenridge	4.0
Illinois Basin	**3.00-3.05**

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.085
Midale C	1.71
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaqin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS+30%)	$3.71
★ Gulf-NY, dirty (ATRS+27.5%)	3.63
★ PG-UK, dirty (Scale—57.5%) (26s. 7d.)	3.72
★ PG-NY, dirty (USMC—61.5%)	4.89
★ PG-Japan, dirty (USMC—66%)	3.47

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless other wise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	11.25-11.50
★ Premium (99 octane)	14.00-14.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75-11.00
Regular (92 octane)	11.00-11.25
Premium (98 octane)	12.00-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
Regular (87 octane)	8.875
Premium (97 octane)	11.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 42-43	11.20
Distillate No. 2	10.20
Diesel fuel, 48-52 d.i.	10.35
Caribbean area (cargoes):	
Distillate No. 2	8.25

RESIDUAL FUEL

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

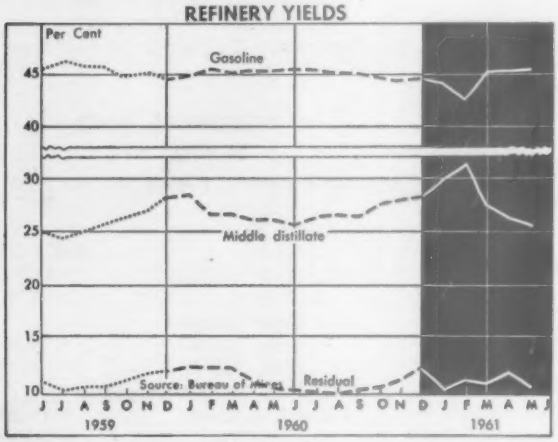
SELECTED MONTHLY DATA

SUPPLY AND DEMAND—PRODUCTS
(Thousands of barrels daily)

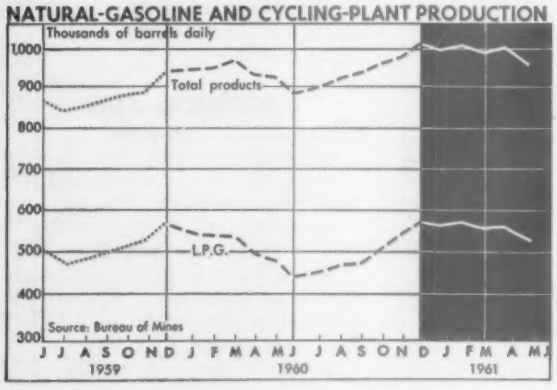
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
July 1961*	4,575	4,290	193,200
June 1961*	4,575	4,110	200,000
May 1961	4,442	4,108	213,399
August 1960	4,501	4,287	190,322
July 1960	4,418	4,243	196,021
KEROSINE			
July 1961*	285	355	32,000
June 1961*	250	320	30,000
May 1961	297	320	28,384
August 1960	277	368	33,379
July 1960	261	360	30,499
DISTILLATE			
July 1961*	1,350	1,880	131,000
June 1961*	1,195	1,760	112,900
May 1961	1,455	1,705	93,636
August 1960	1,222	1,874	152,158
July 1960	1,363	1,778	109,174
RESIDUAL			
July 1961*	1,060	815	49,800
June 1961*	1,250	800	47,500
May 1961	1,329	856	44,137
August 1960	1,230	843	47,177
July 1960	1,377	843	41,074

*Preliminary. †Thousands of barrels.

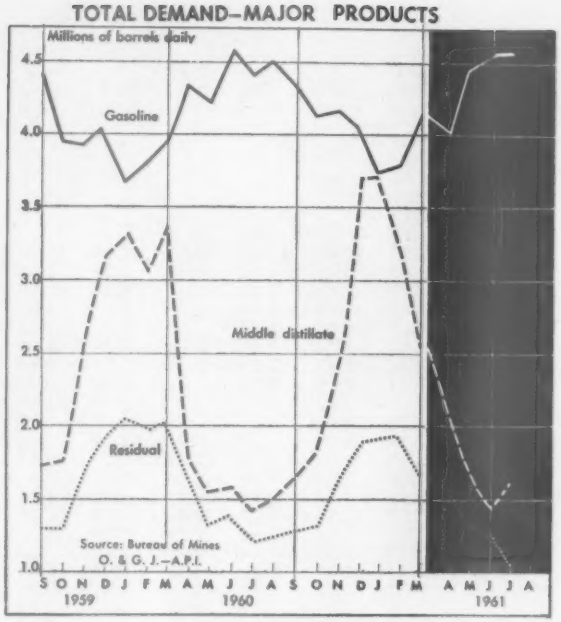
REFINERY YIELDS



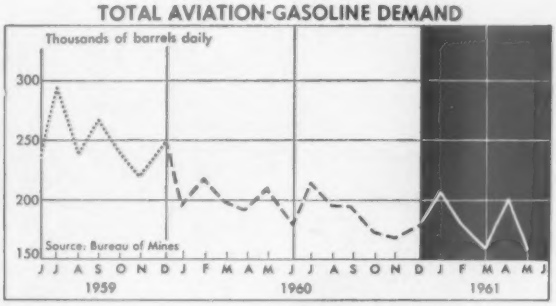
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



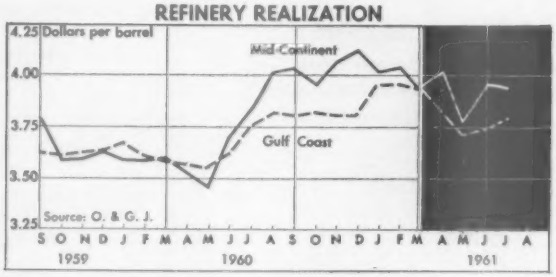
TOTAL DEMAND—MAJOR PRODUCTS



TOTAL AVIATION-GASOLINE DEMAND



REFINERY REALIZATION



REFINERY REALIZATION

	July*	June*	May	Apr.
Mid-Continent	$3.89	$3.94	$3.80	$4.01
Gulf Coast	3.78	3.74	3.75	3.83

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel and residual as published in The Oil and Gas Journal.

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FOR SALE EQUIPMENT

RIG MODEL 2000 Mayhew, Tandem trailer mounted, 8' x 12' steel tool house, separate skid-mounted mud pump with 140 GK Waukehsa engine complete with light plant. Drill collar, drill pipe etc., with 5 ton White truck and Tandem semi-trailer. Lundquist Pipe and Supply Company. LU 5-8850, Tulsa, Oklahoma.

LIQUIDATION

at TORRANCE, CAL.

CAT REFORMER
NEW 1954
To be Sold Piecemeal
at Tremendous Savings
MUST BE OUT IN ~~120~~ 90 DAYS

13'x112'6"x-3/4" TOWER, 250 PSI @ 650°F
23 Bubble Cap Trays
12'6"x98'x1 1/2" REACTOR, 218 PSI @ 850°F
13'5"x19'6"x1/2" HOPPER
16'x150' CATALYST STORAGE BINS (3)
7'x44'6"x1 3/16" DRUM 255 PSI @ 650°F
9'x13'6"x1" DRUM baffled 174 PSI @ 375°F
48"x11'x13/16" DRUM 375 PSI
5'x29'x7/16" DRUM 100 PSI @ 650°F
5'x17'8"x5/16" DRUM
12' PRESSURE SPHERE 220 PSI @ 850°F
12' PRESSURE SPHERE 330 PSI @ 650°F
5' ODx17'6" OA AIR HEATER
197 Sq. ft. Petro-Chem INERT GAS GENERATOR
Compressed GAS DRYER Komp Model 505
400 Sq. ft. U.S. Auto-Jet FILTERS (2)
26"x69" ENTRAINMENT SEPARATOR 600 PSI
2'4"x19'5"x3/8" ELUTRIATOR

HEAT EXCHANGERS—600 to 4250 Sq. Ft.
Chrome, Admiralty, Street Tubes
100 to 1000 PSI

PUMPS

1800GPM @ 141' Pacific 8" Type DC 100 HP (2)
506GPM @311' Pacific 4" Type SVS
450GPM @ 1160' Pacific 3" Type J 3 Stg (4)

COMPRESSORS

4840 CFM Carrier, Centrifugal 8100 RPM, 149.7 PSIA Suction, 239.7 PSIA Discharge Driven by 2066 HP Terry Condensing Turbine, 430 PSI @ 560°F. (2 Units)
604 Ton Carrier, Freon 11 Refrigeration with Condenser & Cooler driven by 639 HP Terry Condensing Turbine, 430 PSI.

Write for Inventory
Send Us Your Requirements

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

FOR SALE EQUIPMENT

FAILING 1500 GOOD machine also pulling unit, and Vermeer trencher in east Kansas. J. E. Newton, 238 South Elm Ave. Webster Groves, Missouri.

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

CLARK MA-4 Gas Compressor, 150 HP, skid-mounted with radiator and accessories; 1 80 ft. flare stack; 4,225 HP Clark Centrifugal Compressor 9,920 CFM 240 PSI discharge Pumps; Exchangers; Vessels. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP, 4-cycle. gas-engine drive.

Phone POplar 3-3505

PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

1800 HP WESTINGHOUSE GAS TURBINE
Driving Two
CLARK CENTRIFUGAL COMPRESSORS
2 compressors in tandem, Model 2M5, 7000 CFM AIR, 100 PSIA. Will Separate.

M. L. Groban
9656 S. Merrion Ave., Chicago 17, Ill.
Phone SAginaw 1-3442

USED EQUIPMENT SALE

at DX Sunray's Tulsa refinery

Solvent Dewaxing Plant

Filters, Presses, Condensers, Chillers, Exchangers, Pumps, Compressors, Motors, Vessels.

DX SUNRAY OIL COMPANY
P. O. Box 381, Tulsa
Inquire L. G. Wells
Phone LU 3-4300

LOCATED HOUSTON, TEXAS
(From Amoco Refinery Co., Destrehan, La.)

HEAT EXCHANGERS
900 to 3,500 sq. ft.
VESSELS—TOWERS
12" to 8' dia.
PETRO-CHEM FURNACES
1/2MM, 3/4MM—1 1/4MM B.t.u./Hr.
PUMPS
50 to 7,000 GPM

—WIRE—PHONE—WRITE—

BRILL EQUIPMENT COMPANY
4101 SAN JACINTO ST., HOUSTON 4, TEXAS
35—65 JABEZ STREET, NEWARK 5, N. J.

FOR SALE EQUIPMENT

FOR SALE: One Cooper double drum model W servicing machine. 3 sheave 50 ft. single pole 8 5/8 x 7 mast, Jerkline spudder, 4,000 ft. 5/8" wire line, mounted on 1954 Chevrolet tandem truck, with tool boxes. Machine and truck in very good condition. Award Pursley, Le Roy, W. Va. Phone Ravenswood, W. Va., BR 3-4005.

Trailer mounted Franks 2,000 rotary, GMC Diesel, 53-ft. mast 8 1/2-in. rotary, 5 1/2x8 G.D. pump, GMC Diesel, 4,000 ft. 2 7/8-in. drill tubing, 300 ft. 4 1/2-in. drill collars, 1957 IHC 200 tandem tractor, K8 tractor, Chevy A frame winch truck, two 35-ft. tandem trailers, light plant, etc., etc. All in good cond. Location Grand Junction, Colo. Total price $50,000. Junction Drilling Co., 2011 Glenarm. KE 4-0253.

LIQUIDATION

at ESSO REFINERY Balto., Md.

MOST EQUIPMENT NEW 1956

TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI
DRUMS—3' to 12' diameter, 12' to 45' long to 530 PSI, some lined—some NEW
PETRO-CHEM FURNACES—30.7; 19.3; 10.4; 9.7; 7.5 MM BTU/Hr.
NEW FURNACE TUBES—4000'—3/8" & 1/2" Wall Croloy 5—4" to 6"
PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes —235 to 2320 Sq. Ft.
Croloy 5 Tubes —573 to 1040 Sq. Ft.
Admiralty Tubes —216 to 1640 Sq. Ft.
Steel Tubes —238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

7500CFM @ 42.5PSIG, 1250HP Synch.
129CFM @ 193PSIA Worth. HB 7 1/2x9

LARGE QUANTITY
TRANSFORMERS & MOTORS

WRITE FOR CATALOG

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.
Boston & Haven St., Baltimore 24, Md.

FOR SALE EQUIPMENT

2500 FAILING 58' mast, 5 x 8 pump, $25,000.00. Failing 1500 trailer mounted $17,500.00. Box 383, Chanute, Kansas.

FAILING 2500, 1500, Trucks, Floats, Drill Pipe, Collars, and related Equipment. Survey Drilling Company, 2032 Hawes Avenue, Dallas 35, Texas.

FOR SALE: Perforating Trucks with Logging Equipment. Will Sacrifice! All Offers Considered. Box M-467, The Oil and Gas Journal, Tulsa, Oklahoma.

(8) 96,000 Bbl. 120'x48'
WELDED CONE ROOF
OIL STORAGE TANKS
INSTALLED NEW in 1952
Dismantled, Matchmarked For
Reerection $75.00 N.T.
FOB Baltimore, Md.

HEAT & POWER CO., INC.
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50,000 ft. 20" No. 1 grade used pipe.
Lengths 20 ft. square cut ends.
Weight 78# to the ft.
High Tensile Pipe.
Indiana-Ohio Pipe Co.
P. O. Box 5482 Shep. Sta.
Columbus 19, Ohio
Phone CL 3-5527—CL 3-5528

6" DRESSER COUPLINGS
Style #40, 24" Long, for Steel Pipe.
Complete with Gasoline Resistant Gaskets.
Unused Surplus $10.75, Regular $31.50
OLDFIELD EQUIPMENT COMPANY
430 W. Seymour Avenue, Cincinnati 16, Ohio
Phone: VAlley 1-5582

FOR SALE

1 7¼" x 12" GD pump with Cummins diesel engine	$8,000.00
1 D 300 Emsco pump with 32" sheave	9,000.00
2 10" Series 900 QRC B.O.P. . . . each	2,000.00

Rams, spools, slips, elevator bails, weight indicators etc.
NOWERY DRILLING COMPANY, INC.
3904 Fairfield Avenue Shreveport, Louisiana

LIQUIDATION
at WHITING, IND.
COMPRESSORS
3—2495 CFM @ 205 PSI Steam Driven
3—11840 CFM @ 325 PSI Steam Driven
1—2760 CFM @ 325 PSI 800 HP
DRUMS
8' x 30' 222 PSI Design
6' x 15' 342 PSI Design
6' x 22' 1260 PSI Design
TOWERS
8' x 63'—18 tray 390 PSI
7' x 83'—30 tray 342 PSI
4' x 83'—34 tray 222 PSI
PUMPS—EXCHANGERS—VESSELS
Write for Inventory
Send Us Your Requirements
HEAT & POWER CO., INC.
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FOR SALE EQUIPMENT

WELL SERVICING UNITS FOR SALE Franks Model 26-DTM Double drum well servicing units, complete with lines and tools. Located northeastern Oklahoma. Box 5371, Tulsa, Oklahoma.

DOUBLE DRUM Cooper unit with spudder attachment. Inventory available. Excellent Condition. Box 736, Great Bend, Kansas, Phone GL 3-8817.

28L EXCELLENT condition. Portable and completely and fully equipped with all tools. Call Bill Roberts, Glasglow, Ky. telephone OL 1-3850.

GAS ENGINE PARTS
New and Reconditioned parts for 20" x 36" Snow Gas Engine
write or call
HOPE NATURAL GAS COMPANY
Material Control P. O. Box 1951
Clarksburg, West Virginia
Phone MAin 4-5451

EQUIPMENT WANTED

INTERESTED IN purchase of production equipment of all types, particularly interested in 80,000 to 320,000 Peak Torque Pumping Units. Surplus Oil Equipment Ltd., 534-6th Avenue South West, Calgary, Alberta, Canada. Telephone: AMherst 3-2839.

WANTED TRUCK mounted Hydraulic Casing Pulling machine, complete, ready to work. Prefer one with ⅜" sand line and power brake out. Call or write Luke Wise, Community Gas & Oil Co., Billings, Montana.

HELP WANTED

REFINERY ENGINEER—Graduate engineer, preferable B.S. in mechanical engineering with at least two to three years refinery experience, to supervise scheduling of maintenance, new construction, etc., for modern refinery in mid-continent area. Our employees have been informed of this advertisement. Box M-518, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERVISOR for Mexican project. Prefer Mechanical Engineer with substantial background all phases plant construction. Box M-515, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma

MECHANICAL ENGINEER, experienced in manufacturing and oil field production methods and equipment, for field and office work in Engineering Department of old, well known, oil field equipment manufacturer. Must be around 30-35 years of age. Excellent opportunity. Box M-502, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED: Process engineer, experienced in Alkylation, Cat-Reforming, Cat-Cracking and General Refining Processes. Refinery Located in Midwest. Reply: Box M-508, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER
Refinery Process Engineer with Chemical Engineering degree and 3 to 5 years experience, for our Arkansas City, Kansas refinery. Furnish resume of education and experience, references and salary requirements to:
APCO OIL CORPORATION
1000 Liberty Bank Building
Oklahoma City 2, Oklahoma

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Public relations department of international oil company needs business writer who knows oil. We want fast writer of unadorned prose. Congenial, professional shop offers varying assignments including speeches, policy statements, brochures, presentations, articles, investor information. Our staff is helping in this search.
Location, New York City. Send resume and salary requirement in confidence to.
Box M-526, The Oil and Gas Journal
Tulsa, Oklahoma
—An Equal Opportunity Employer—

HELP WANTED

PETROLEUM ENGINEER with engineering degree with 3 to 5 years experience in primary and secondary operations for work in the Permian Basin for independent oil company. Reply: Box M-525, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL FOREMAN
FOR WELL ESTABLISHED
PRODUCTS PIPELINE COMPANY
Responsible for maintenance of all electrical facilities in district including remote control pump stations. Good plans and benefits. West Texas headquarters.
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The Oil and Gas Journal
4041 Marlton Ave., Los Angeles 8, Calif.

Production Research
ENGINEER
The production research department of a major oil company has an opening for a qualified man to develop new well completion methods and techniques. MS or PhD in petroleum or chemical engineering with training in reservoir or production engineering or production research. Applicant should have experience with drilling and completion practices. Location Eastern USA.
Send complete resume of formal training and experience to:
BOX M-527,
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

PROCESS ENGINEER
Immediate opportunity for Chemical Engineer with petroleum refinery experience. Minimum of three years in Processing Engineering Group or Technical Service Group. Include in resume ability to evaluate raw charge feed stocks and make economic studies. Refinery located in major center of Louisiana.
Our employees know of this ad.
Submit complete resume of experience, education and salary requirements. **Write:**
Box M-519
The Oil and Gas Journal
Tulsa, Oklahoma

INSTRUMENT ENGINEERS
Positions available in Los Angeles for graduate engineers with good experience in petroleum and chemical plant instrumentation, who are interested in the application engineering of complete control systems. Nuclear experience is also desirable.
Send complete resume in confidence to:
Mr. H. K. Willwater
Employment Supervisor
FLUOR CORP.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

SITUATIONS WANTED

GEOPHYSICIST-GEOLOGIST B. S. Geology and year graduate work. 15 years field, interpretive, supervisory seismic experience. Desires immediate relocation supervisory or geological-geophysical coordination position. Interpretive experience widely varied including foreign. Married. Box M-524, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MANAGER, LLB Degree, 10 years' experience, 6 with Major, 4 as Manager for Independent. Qualified to manage small oil company or division, specialize in well deals. Experienced Gulf Coast, Mid-Continent, Rocky Mountains, Alaska, some foreign. F. C. Nance, FL 2-7107, 3605 Duchess Trail, Dallas, Texas.

PRACTICAL ENGINEER experienced in drilling, completions, workover jobs, repressuring and/or secondary recovery. Box M-506, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST-SEISMIC, gravity and magnetics interpreter. Only career opportunity considered. Relocate anywhere with family housing and schools. Mutual confidence expected of inquiry. Contact P. O. Box 3321, Bellaire, Texas.

PALEONTOLOGIST, 44 single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

AVAILABLE—Representative for Service or Industrial Organization at Austin, Texas. Experienced accountant and statistician can retire from large state department. Wide experience and acquaintance in state tax and regulatory work. Will consider position. Box M-517, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MAN thoroughly experienced in producing properties, well completions, and workovers wants position as production foreman or superintendent with growing independent. References upon request. Will relocate. J. E. Hodges, 1843 Westridge, Wichita, Kansas.

ENGINEER, EXTENSIVE experience in United States, Europe, and Africa, exploration and production. Languages: French, Italian. Desires position with American company, preferably in Europe. Contact Box M-520, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST—35, M.S. 11 years experience in geological and geophysical exploration in Canada and South America. Currently area geologist with Major Oil Company. Desires responsible position in company with aggressive exploration program. Box M-523, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER seventeen years intensive, broad background in Budget Administration, Economic Evaluations, Cost Analysis, Establishing Accounting Procedures, Manpower and Efficiency Studies, Operations, Technical Supervision, and Petroleum Refining. Box M-522, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

DO YOU HAVE A LEASE TO SELL? For as little as $3 per week you can tell your proposition to over 45,000 oil men through The Journal's classified advertising pages. You'll be surprised how many are interested.

HIGH GRADE DEVONIAN oil in wild cat. State log with analysis of samples. Geologist recommendation. Other confirmation. Clark County, Ill. Will farm out block for offset. Small oil rig. W. V. Tarman, Martinsville, Ill. Phone 128.

ARIZONA HELIUM 8%

Probable price for Arizona gas with helium content to be paid by Kerr-McGee $2.00 m.c.f. at well meter. Refinery to be ready to process gas about year's end 1961. Daily estimated capacity 2,500,000 cu. ft. helium gas. Present commercial users pay $19.00 per MCF retail, for helium from other plants in Texas, Oklahoma and Kansas. Get your 5 year leases state lands now. Free information. John L. Donahue 430-16th. St., Denver 2, Colorado.

LEASE AND DRILLING BLOCKS

FOR SALE: Two gas leases in the Sabinsville, Pennsylvania field. Titles O.K. Make an offer. Some price cut if deal can be closed in 30 days. Write: Jake D. Trimmer, Wellsville, N. Y.

OVER 7,000 ACRES, good ten year commercial oil and gas leases for sale. Located in Northwest part of Ohio. Write to: Box M-504, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND FOR LEASES; 60,000 acres Columbia Basin Wildcat area. 1 exploration well drilled—90 ft. of Odessa Sands T. D. 4,700 ft. Wire or write for complete report. C & D Minerals, Inc., 422 Paulsen Bldg., Spokane 1, Washington.

SOUTHWEST CRANE County, Texas: Oil and gas lease, five years primary term, S/239 acres, section 18, Block B-28, PSL survey, 2 miles from new oil gulf devonian shows in sec. 15, Blk. B-28, PSL, Ward County, Texas. Great potential bargain. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

FOR SALE: Daviess County, Kentucky interest in well to be drilled updip structurally from old hole with substantial show of free oil on drill stem test on cypress sand 1950 ft., 3 more shows of oil on electric log. Sub-surface map available. Contact D. C. Holman, 605 S. E. Riverside, Evansville 13, Indiana. Phone HA 2-7985.

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PROSPECTIVE OIL LEASES: Am fee landowner over 2,000 acres near Pan American Petroleum Corporation No. 1 List, Sec. 23, Block 68, Township 1, T&P Survey, stratigraphic test, projected to 8,500 feet. anticlinal axis nearby, Hudspeth County, Texas, leases available Hudspeth, Crane, Terrell Counties, Texas. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

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Phone SU 1-3791

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OIL MAPS

PROPERTY LINE maps covering townships in northwestern Pennsylvania for sale. Clarion Development Company, 3201 Peach Street, Erie, Pennsylvania

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah. Sealed bids will be received until 2:00 P.M. Mountain Standard Time, September 6, 1961, and opened at that time in the office of the Uintah and Ouray Agency, Fort Duchesne, for the leasing of 29,681.81 acres of tribal Indian lands and 979.2 acres of allotted Indian lands, in Townships 3 and 4 South, Ranges 3, 4, and 5 West, Uinta meridian, Duchesne County, Utah, for oil and gas mining purposes. Details of the lease opening and how and where to file bids may be obtained by addressing an inquiry to the Superintendent, Uintah and Ouray Indian Agency, Fort Duchesne, Utah.

More Fields

West Virginia's Braxton attracts drill

IN BRAXTON COUNTY, West Virginia, there are seven wells now drilling and three new locations filed with the Department of Mines as of July 28.

The major pay is the Benson sand. This is in the Chemung zone of the Upper Devonian about 4,150 to 4,300 ft. Gas pay is about 3-5 ft. thick. The porosity of this formation is such that its susceptibility to sand fracturing is ideal. Average natural production is about 100 M.c.f.

These wells fracture from 4 to 10 M.M.c.f. with average rock pressures of 1,600 psi. The above production figure is flush production, or production immediately after fracture. The depletion curve of these wells is rather abrupt for the first 6 months, usually leveling off after this 6-month period, gradually declining to final depletion of the well which is about 8-10 years.

Figures compiled on these Benson wells show an average of a 12% return the first year. Exceptions where some have returned entire investment in the first 6 months are reported. Average cost of drilling a Benson sand well is $45,000.

Leasing has been active by independents and also by major companies.

Lewis County. This county has 32 locations and 41 drilling wells. Leasing activity has been very brisk both by independents and majors. There is some farming out of leases, but to no great extent.

The major pay here is the Big Injun sand, located in the Pocono zone of the Mississippian. This is found at about 2,100 ft. The formation is about 45 ft. thick, having two pay zones, usually. The first is about 12-15 ft. in the zone and the better pay is near the bottom of the formation. The average natural production is rather light—from 50 to 100 M.c.f. and usually some oil. This formation is a long-known reservoir, but until recent years shooting was depended on to increase the permeability.

This sand has also proved very susceptible to fracturing, increasing the production about 400%; the average production per well after fracture is 2 M.M.c.f., with 700-800-psi. rock pressure. This is also flush production, with an abrupt depletion curve, but is less precipitous than Benson production. The average life is 4-6 years longer, or 12-18 years, as opposed to Benson wells.

Average cost of drilling a Big Injun well is about $20,000. Injun wells are of more interest to independents than Benson wells, cost being the big factor. Also, Lewis County has had about 2% dry holes this year compared to Braxton County Benson wells which had 15 to 20% dry holes.

Oil production from the Injun sand merits mention. Most of these wells are combination oil and gas. The exceptions are where oil is the predominant production, but depletes much faster than gas. Some oil wells make 100 bbl. per day, but the life of these wells can be counted in weeks. Hence, developers look for gas.

The average fracture treatment for Injun sand is 800 bbl. water and 75,000 lb. sand at a cost of $4,500. Benson is treated with an average of 1,200 bbl. water and 100,000 lb. sand at a cost of $5,200. Fracturing is done through the production string, being 5½-in. or 7-in. o.d. casing.

Activity in Lewis County started in the southwest part of the Burnsville Quadrangle and has extended through the county. It appears to be running a course north-northwest into the southeast part of Vadis Quadrangle, southwest part of Weston Quadrangle, and the northwest part of Crawford Quadrangle.

Discovery wells

WYOMING

Campbell County:
Clark Oil & Refining Co. F-50-70-4-C1, C NW NE 4-50n-70w. IPP 30 BOPD, 39°, Muddy discovery, new field. Muddy 7,251-58 ft. TD 9,096 ft.

WESTERN CANADA

Alberta:
Home-CMG 7-17 Pendor, LSD 7, 17-3-8w4. Gas discovery. TD 6,675 ft.
Canadian Superior et al. 6-18 Wilson Creek, LSD 6, 18 43-4w5. Branff gas discovery. TD 7,285 ft.
Mobil 16-34 Twining, LSD 13, 34-31-24w4. Pekiso oil discovery. TD 5,491 ft.
Canpet-Devonian-Palmer 13-28 Penhold, LSD 13, 28-36-27w4. D2 oil discovery. TD 7,700 ft.
British Columbia:
Pacific-Imperial D-95-B, 95-B-94 G-8. Triassic gas discovery. TD 5,076 ft.

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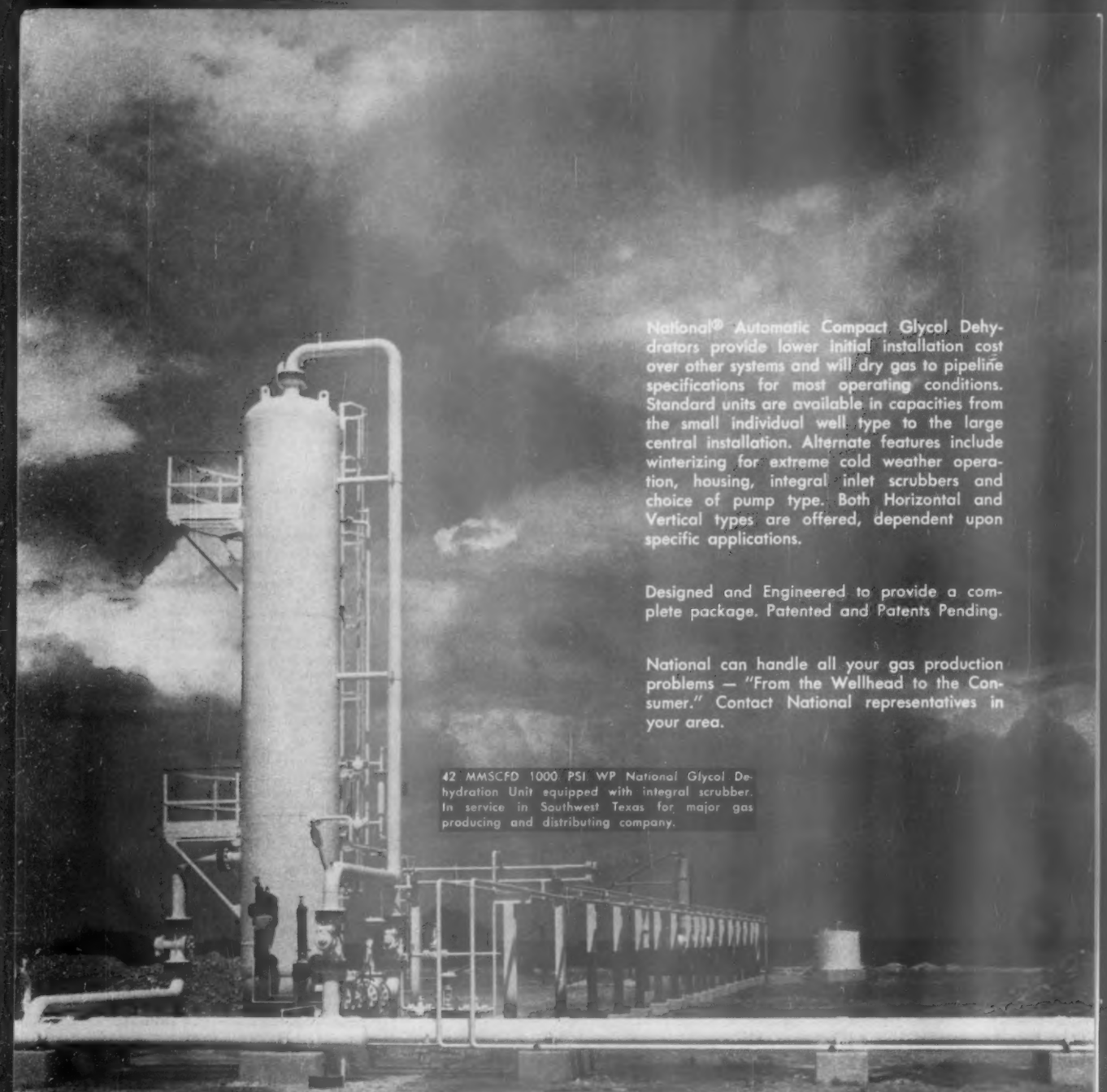

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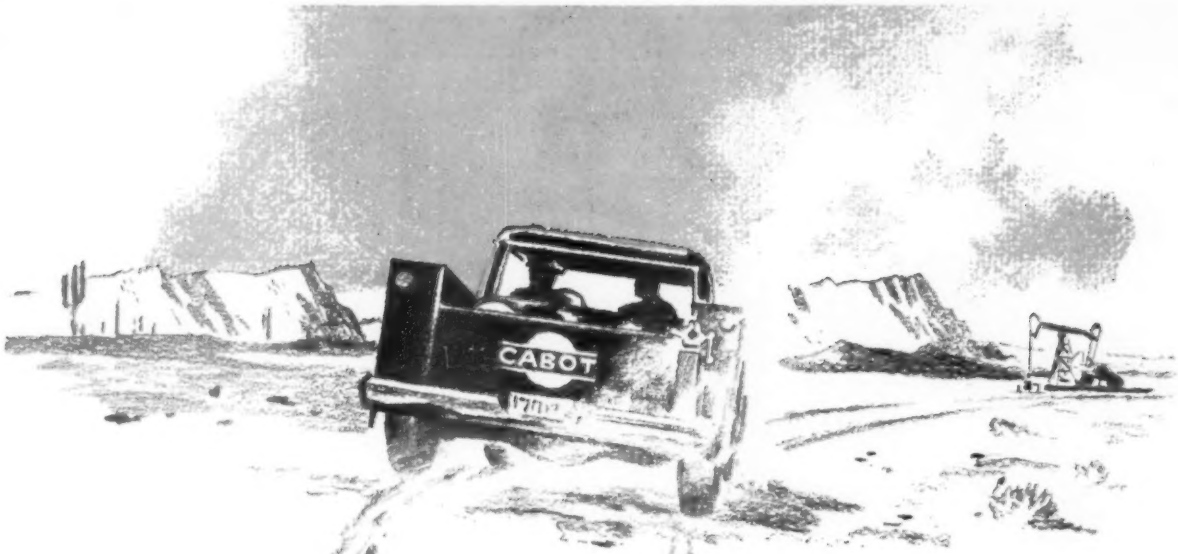

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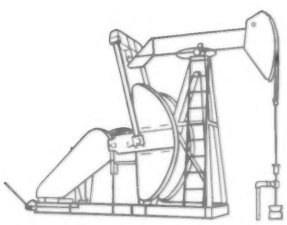

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